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THE Journal OF THE
AMERICAN DENTAL ASSOCIATION
JULY 15, 1947 • VOLUME 35 • NUMBER 2

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EIGHTY-EIGHTH MEETING
AMERICAN DENTAL ASSOCIATION AND
TENTH INTERNATIONAL DENTAL CONGRESS

BOSTON, MASSACHUSETTS
AUGUST 4, 5, 6, 7, 8, 1947

The Journal of the American Dental Association, Vol. 35, No. 2. Published by the American Dental Association, 222 E. Superior St., Chicago 11, Ill. Yearly subscription $7.00 for U. S. and possessions; $8.00 for foreign countries. Single copy forty cents. Entered as second-class matter, May 27, 1942, at the post office at Chicago, Ill., under the act of August 24, 1912. Published semimonthly. Copyright 1947 by the American Dental Association. The Journal of the American Dental Association is indexed in the Index to Dental Literature and, in part, in the Quarterly Cumulative Index Medicus, Biological Abstracts and Chemical Abstracts.

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

JULY 15, 1947 • VOLUME 35 • NUMBER 2

VERTICAL DIMENSION AND OCCLUSION RESTORED BY MEANS OF A LOWER PARTIAL DENTURE

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THE following case report concerns a patient presenting an extreme loss of vertical dimension and lack of occlusion. There are many ways of restoring vertical dimension, such as metallic splints, onlays, full dentures, partial dentures and so forth, depending on the particular case. At the same time I am aware of the fact that most bite opening restorations, especially where teeth are present, represent quite an undertaking involving a great deal of time, patience and sometimes uncertainty and disappointment.

In this particular case the patient's self consciousness caused by his prognathous and closed bite appearance (Fig. 1, above) plus an inability to masticate food properly gave us the impetus to try to solve his problem. A lack of adequate time plus a peculiar intradental relationship and lack of a number of lower teeth prompted us to seek a simple but effective treatment mainly by limiting the restoration to one jaw (Fig. 2, A and B). A lower partial denture with acrylic onlays was decided on and made (Fig. 2, C and D). The denture, which was considered a more or less temporary measure, has given the patient a great deal of satisfaction both from an esthetic and a functional point of view (Fig. 2, E and F). Since the first few adjustments there has been no muscular, temporomandibular joint or tooth soreness. The 5 mm. restoration of bite which was obtained has been tolerated very well.

Extra-oral observation of the patient showed him to possess a protrusive lower jaw which seemed to be accentuated by an obvious loss of vertical dimension. Intra-oral examination, however, revealed a constricted upper arch with all the remaining teeth in the maxilla lingual to the mandibular teeth (Fig. 2, A and B). The only occlusion present was that of a few square millimeters on the occlusal tables of several remaining lower posterior teeth. The lower jaw was of normal size. Roentgenographic studies showed an infected lower left central in-

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cisor. A 10 mm. loss of vertical dimension was determined by the simple expedient of measuring the difference in millimeters between the upper and lower jaws with the teeth closed in centric relation, with the lips in passive contact pronouncing the letter M and with the jaws apart and at rest.

On consultation it was decided to make the patient a partial lower denture which would supply occlusion and restore a more normal vertical dimension. Impressions were taken with an alginate material and poured up in stone. Six millimeters of vertical dimension and centric relation were added and recorded by the wax bite registration. The average individual has an opening of 2.53 mm. between the upper and lower teeth when the jaws are at rest and apart. This accounted for the inability to obtain a greater restoration of bite and allow a certain margin of safety at the same time.

The maxillary and mandibular casts were articulated. The lower cast was surveyed; then undercuts were blocked out and duplicated. A gold lingual bar was cast with clasps on the four remaining lower posterior teeth together with four occlusal caps for the retention of acrylic

Fig. 1.—Above: Prognathism in which a 5 mm. vertical dimension was lacking. Below: Patient after restoration of vertical dimension and occlusion

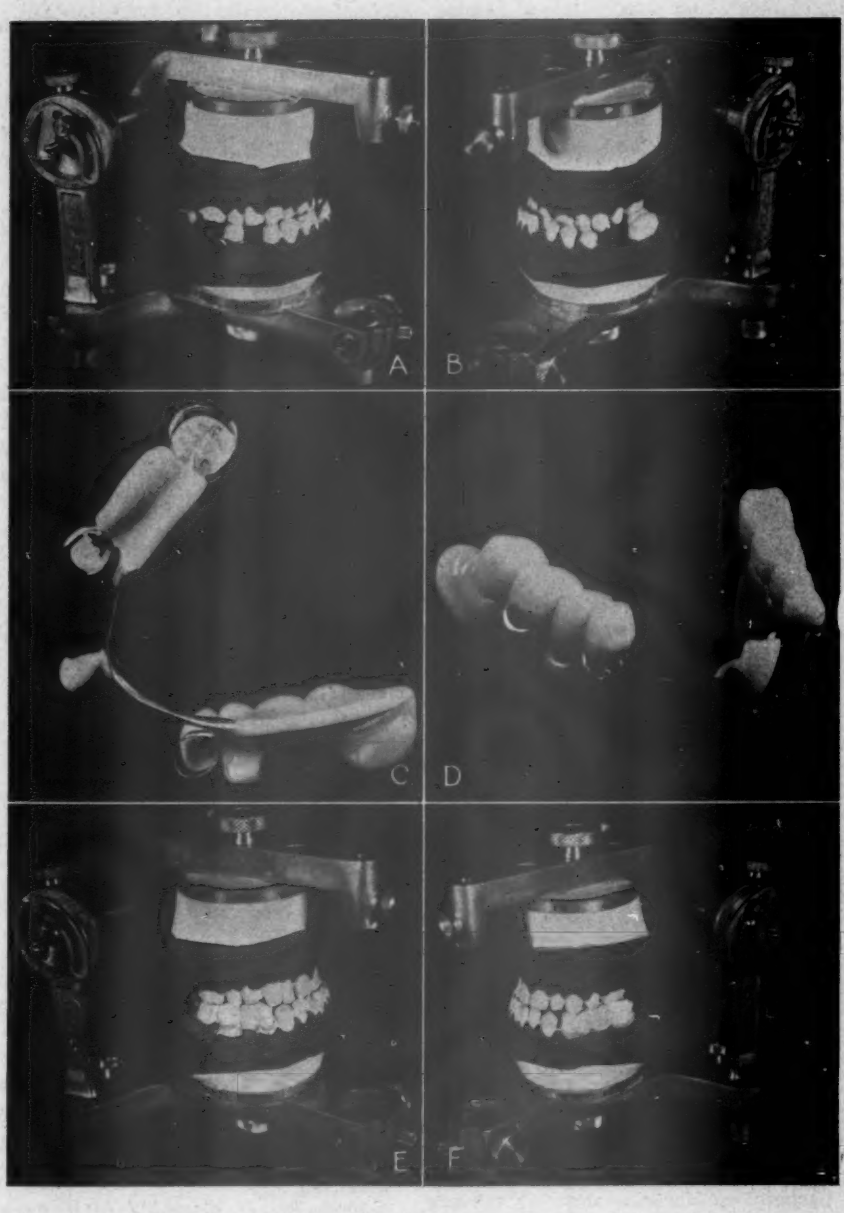

Fig. 2.—A and B, models showing condition before treatment. C and D, acrylic onlays. E and F, models showing restoration of vertical dimension and occlusion

onlays. The gold casting was placed back on the master model and the occlusal portion of the denture was waxed up over the remaining posterior teeth, as well as in the edentulous area, and processed. Next, the denture base was waxed up on the master model and processed to the previously curved occlusal portions.

The patient was called to the dispensary, and the infected lower left central incisor was extracted. When the tooth had been added to the partial denture and treated as an immediate insertion the denture was tried in the mouth. After spot grinding and milling in of the dentures the vertical dimension was checked, and there was a final bite restoration of 5 mm.

The patient was instructed to wear the partial denture for the remainder of the day and night and to come in for examination on the following day. On reexamination the patient complained of soreness of the lower right second bicuspid but there was no muscular or temporomandibular discomfort. The occlusion was checked, and several high spots were reduced by spot grinding. When the patient was examined about three days later a slight overextension of a flange was relieved, but no further evidence of discomfort was noted. Several weeks later when the patient was again seen he was getting along comfortably. His improved appearance is shown in Figure 1, below. An additional opening of 2 or 3 mm. may be attempted later if it is deemed necessary.—*212 South Marion Street.*

LOCAL FACTORS IN DENTAL CARIES: A CRITICAL REVIEW OF THE LITERATURE

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BASICALLY, the theories on the causes of caries may be divided into three groups. The first group comprises those theories which regard local and environmental conditions as major factors. In the second group systemic conditions (heredity, internal or endocrine secretions, blood relationships, nutrition and pregnancy) are considered of prime importance. The third group is a combination of the first two groups.

The major concern in this paper is with the first group, which is divided into: (1) tooth structure theories, (2) bacteriologic theories and (3) salivary and chemical theories. In order to handle the great mass of contributions more easily, the discussion will be divided into two parts, with the year 1925 as a dividing line.

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Early Controversies

In this country the initial impetus to the chemical theory was given in 1821 by L. S. and E. Parmly.[1] This concept was at odds with the accepted inflammation theories of Hunter[2] and Fox[3] at that

1. Cited by McKay, F. S., Historical Review of the Major Episodes in the Attainment of the Scientific Concept in Operative Dentistry. *J.A.D.A.* 21:415 (March) 1934.

2. Hunter, John, *The Natural History of the Human Teeth.* London: 1771 (printed for J. Johnson), Part II, p. 1.

3. Fox, Joseph, *The Natural History and Diseases of the Human Teeth.* London: E. Cox & Son, 1814 (second edition), p. 2.

time, and much controversy resulted. In 1835, Robertson[4] substantiated the concept of the Parmlys:

> The only cause of the partial operation and the particular situations of decay, is the corrosive or chemical action of the solid particles of the food which have been retained and undergone a process of putrefaction or fermentation in the several parts of the teeth best adapted for their lodgment.

In 1848, Tomes[5] offered his theories, differing somewhat with his countryman, Robertson. He thought that both Fox and Robertson were right as far as they went and that "caries may be defined to be death and subsequent progressive decomposition of a part or whole of a tooth." At this date he thought that caries was a part of the general vital action. This view was altered in his second edition (1873)[6] after the work of Magitot[7] and Leber and Rottenstein.[8] Magitot found that dissolution of the tooth structure was possible by the action of dilute acids produced in the mouth. He showed that sugars on fermentation produced lactic acid, which attacked the calcium salts of the teeth. Experiments *in vitro* showed decalcification of extracted teeth by other organic acids. Magitot concluded that it could be "perfectly established that dental caries results from a direct alteration of the organ by means of substances which originate in the saliva, or are accidentally introduced, an alteration usually preceded and favored by certain congenital or acquired predispositions of structure or anatomic conformation."

Leber and Rottenstein[8] did much in focusing attention on the bacteria of the mouth and the effect of parasites on tooth structure. Not satisfied that acids were the sole causative agent, these investigators sought a parasite and were rewarded by finding the Leptotrichia buccalis in the dentinal tubules. They believed that although dissolution of enamel was a slow process and was produced by the action of dilute acids, the progression of caries was comparatively swift in dentin and the accelerated rate was due to the L. buccalis. The exact role of the bacteria was not made clear, but the inference was made that the presence of fungi was indicative of participation in acid fermentation.

The chemoparasitic theory was given another boost by Underwood and Milles[9] at the International Medical Congress in 1881. They produced caries *in vitro* with acids and concluded that caries was produced *in vivo* by acids liberated by micro-organisms. They believed that the action of bacteria was direct, destroying the inorganic salts and leaving the organic structure to disintegrate as it might.

New Scientific Approach

The first of a long series of contributions by Miller appeared in 1882. His major contribution was not a new theory but a new scientific approach based on Koch's postulates. His deductions were the result of study of thousands of sections of decayed teeth and of countless bacterial cultures. In 1883, Miller[10] reported that the L. buccalis noted by Leber and Rottenstein was the chief agent in the production of caries. Several forms were observed, and the coccus was found to be the most destructive to tooth tissue.[11] Other forms were found

4. Robertson, William, *A Practical Treatise on the Human Teeth*. Birmingham, England: Richard Davies, 1842 (third edition), p. 37.
5. Tomes, John, *Dental Physiology and Surgery*. London: John W. Parker, 1848, pp. 197-201.
6. Tomes, John, and Tomes, C. S., *A System of Dental Surgery*. London: J. & A. Churchill, 1873.
7. Magitot, M. E., *Treatise on Dental Caries* (Chandler translation). Boston: Houghton, Osgood & Company, 1878, pp. 158-159.
8. Leber, T., and Rottenstein, J. B., *Dental Caries and Its Causes* (Chandler translation). Philadelphia: P. Blakiston, Son & Company, 1883.
9. Underwood, A. S., and Milles, W. J., An Investigation into the Effects of Organisms upon the Teeth and Alveolar Portions of the Jaws. *Am. J. D. Science* 15:546 (April) 1882.
10. Miller, W. D., Caries of the Human Teeth. *Independent Practitioner* 4:609 (December) 1883.
11. Miller, W. D., *The Micro-Organisms of the Human Mouth*. Philadelphia: S. S. White Dental Manufacturing Co., 1890.

later with cocci and diplococci either singly or in chains, a fungus occurring in the form of bacilli. Miller's sections of tubules showed threads, cocci, rods or a mixture.[12] Miller experimented with saliva, excluding the micro-organisms found, only to find that the saliva then contained nothing which would generate an acid. Exhaustive fermentation studies on the saliva were made by Miller, and he showed that the bacteria were not the result of the acid but the acid a result of bacterial activity. Many contemporaries had believed that bacteria were the result of fermentation rather than the cause. Miller[12] wrote:

> Dental decay is a chemico-parasitic process consisting of two stages, the decalcification of the enamel, which results in its total destruction, and the decalcification of the dentin as a preliminary stage, followed by the dissolution of the softened residue. The acid which effects this primary decalcification is derived from the fermentation of starches and sugars lodged in the retaining centers of the teeth.

Underwood and Milles[9] had reached the same conclusion. The views of men who believed that inflammation was a causative factor in caries were not shared by Miller:[13]

> It is not possible to produce decay, or any thing resembling it, by means of any or all of those mechanical or chemical agents which invariably produce inflammation in other tissues. We all know very well that we may file, grind, saw, bore and pound the living dentin, we may break away large portions with the forceps or subject it to the action of the most irritating substances; we cannot produce in this way a trace of caries. The operation of filling teeth is of itself a continued testimonial to the inconsistency of the inflammatory theory of decay, for we know very well what would result if we should bore a hole in any tissue capable of inflammation (bone) and pound it full of gold.

From the mass of clinical and statistical material that Miller studied, he evolved what we call a scientific approach to the problem of caries. Phrases such as "apparently," "it would seem" and "in all probability," a rarity in writings of his contemporaries, found frequent usage in his voluminous contributions to the *Independent Practitioner* and *Dental Cosmos*. His conclusions were summarized as follows:

> I do not, however, wish to be understood as saying that acids or pathogenic bacteria, or putrefactive bacteria, or all together, are the sole and only cause of decay of the human teeth. What I am prepared to say is this, that in my opinion there is not a single case of caries in which micro-organisms do not play some part, and that in most cases they play a very important part.[14]

Miller convinced his contemporaries that his explanation of the cause of dental caries was a simple and logical one, and for about ten years, or until 1890, there was a brief respite in the caries controversy, highlighted only by the concerted attacks of C. F. W. Bodecker and Abbott in their support of the Heitzmann theory, which claimed that enamel was vital.[15-17] It was believed that fine reticular fibrils pervaded the interstices between the enamel rods and were connected with the dentin. According to this theory, the laying down of enamel and dentin was the result of calcification of concentric layers of corpuscles. Caries was held, by this logic, to be a reverse process of tooth formation, with decalcification, liquefaction and ultimate return to original components. These men were unable to support their theory with factual evidence. Nevertheless, the theory had a slow and painful death because of the intense convictions and tenacity of its proponents.

12. Miller, W. D., A Study of Certain Questions Relating to the Pathology of the Teeth. *D. Cosmos* 47:18 (January) 1905.
13. Cited by McKay, F. S., *op. cit.*, p. 420.
14. Cited by Marshall, J. A., The Etiology of Dental Caries. *Pacific D. Gaz.* 33:396 (August) 1925.
15. Bodecker, C. F. W., *Anatomy and Pathology of the Teeth*. Philadelphia: S. S. White Dental Manufacturing Co., 1894.
16. Bodecker, C. F. W., and Heitzmann, C., Development of Dentin. *Independent Practitioner* 8:337 (July) 1887.
17. Bodecker, C. F. W., and Heitzmann, C., Living Substance in Dentine, Cement and Enamel. *D. Items Interest* 8:208 (May) 1886.

Discovery of Bacterial Plaques

Despite conclusive evidence in favor of Miller's findings, several men believed that further investigation was necessary and attempted to demonstrate a selective localization of caries by bacteria which are protected by a self-produced gelatinous plaque. Both Williams and Black can be considered contemporaries of Miller. Williams, having spent some time in Heitzmann's laboratory, was well qualified to discuss the embryologic origin and histologic structure of the dental tissues, particularly the enamel. By means of photomicrographs that had been laboriously prepared, he demonstrated in 1885 that enamel, once completely formed, undergoes no structural change during life "and probably no molecular change."[18]

Since there was no apparent change in the enamel, the caries must be due to environmental factors. Williams[19] found various leptotrichia and threadlike forms in the saliva, as well as curved bacilli, short thick bacilli and large micrococci and diplococci. These micro-organisms invariably were found in carious lesions, in the form of bacterial colonies or plaques.[20] These plaques were adherent to the enamel in incipient caries, and Williams strongly believed that thorough oral prophylaxis was partly the answer to caries control. He coined the slogan, "A clean tooth cannot decay."[18] The later hotbed of controversy on the permeability of enamel took much of his time. In 1923, he demonstrated that mottled enamel in persons 50 to 60 years of age had showed no appreciable change in structure, despite exposure to oral fluids.[21]

18. Cited by McKay, F. S., *op. cit.*, p. 428.

19. Williams, J. L., On the Formation and Structure of Dental Enamel. *D. Cosmos* 38:101 (February) 1896.

20. Williams, J. L., A Contribution to the Study of Pathology of Enamel. *D. Cosmos* 39:169 (March) 1897.

21. Williams, J. L., Mottled Enamel: And Other Studies of Normal and Pathologic Conditions of This Tissue. *D. Digest* 29:149 (March) 1923.

Further Investigations

Black's work closely paralleled that of Williams. Noyes[22] gives Williams the credit for stimulating Black in his study of bacterial plaques, but as early as 1884 Black had tossed aside the theory that decay was the result of a vital force within the tooth. Speaking of experiments he made with sheep's teeth, ivory and extracted human teeth subjected to dilute acids, Black[23] stated:

> The decay was, to all appearance, the result of similar if not precisely the same causes. . . . This of course could not be the result of vital forces existing in the structure undergoing the process of decay. If dead substances decayed the same as living ones, the forces which bring about the result must be other than the vitality of the suffering organ, and therefore cannot be the result of inflammation.

The source of the acid and the enigma of caries localized in certain parts of the tooth were never satisfactorily solved so far as Black was concerned. The answer seemed to lie in fermentation of food debris, which formed weak organic acids in protected regions through the agencies of living organisms. This concept of a germ disease was closely akin to that of Miller, and Black enthusiastically endorsed Miller's efforts. Black isolated fourteen varieties of micro-organisms which he classified as more than temporary inhabitants of the oral cavity. He took the view that several kinds of organisms acting together were the cause of caries.[24] When Williams presented his excellently illustrated material disproving vitality of enamel, Black came to his support immediately, for he had reached amazingly similar conclusions at almost the same time.

22. Noyes, F. B., Dental Caries: A Review of the Development of the Century. *J.A.D.A.* 20:2119 (December) 1933.

23. Black, G. V., *The Formation of Poisons by Micro-Organisms. A Biological Study of the Germ Theory of Disease.* Philadelphia: P. Blakiston, Son & Company, 1884, p. 149.

24. Black, G. V., *A Work on Operative Dentistry*, Vol. I. Chicago: Medico-Dental Publishing Company, 1908, pp. 138-141.

In 1895, Black published his reports on physical characteristics of dentin of carious and noncarious teeth. He took a large number of extracted teeth and determined the specific gravity, percentage of water, calcium salts and organic matter in the dentin. Black pointed out the close similarity of the specific gravities of all the teeth; the highest was 2.133 and the lowest 2.036, with an average of 2.092. Often there was a greater difference in the teeth of the same person than in the teeth of different persons. It was determined that carious teeth had 0.07 per cent more calcium salts than did perfect teeth. Black[25] concluded that "the teeth of persons who suffer much from caries are just as heavy, just as hard, just as dense, and contain just as much lime salts as the teeth of persons who do not suffer from caries." In one particular all teeth were similar—their solubility in acids. Only recently has Black's observation been substantiated.

Still stimulated by Williams' findings on bacterial plaques, Black set out to study further the beginning of caries and the effects of the disease histologically. He devised a machine to cut and grind tooth sections of incipient caries, an operation which had been impossible previously. On the basis of results obtained, he altered his theory of the decomposition of retained food by acid-forming bacteria. His sections indicated that caries was due to growth of a colony of acid-forming bacteria firmly attached to the surface of the enamel.[22]

Black recognized that immunity to caries, like immunity to other diseases, had a material basis and could be found; that there must be modifying substances in the saliva, affecting the action of bacteria, and that although caries-producing organisms were present in the mouths of immune persons they were unable to attach themselves to the surfaces of the teeth and to confine their acid at the point of formation. Black never answered the dramatic question he posed to his colleagues as he laid down his work, "By what power is the acid confined upon that spot?"[26]

Acid-Producing Bacteria

In 1899, Goadby[27] found streptococci, staphylococci, yeasts, lactic acid bacilli and an organism called Bacillus necrodentalis in sectioned carious teeth. He concurred in the belief that bacteria produce acids which cause dental caries.[28] He noted two types of caries—rampant, which affects most of the teeth, and slow, which affects only a few teeth and is rather slow in action. In the former, the bacteriologic picture was different, with a percentage of organisms fermenting carbohydrates forty times that of other oral bacteria. Caries-free mouths showed only a small percentage of acid-producing organisms.[29] In his later work, Goadby minimized the role of the B. necrodentalis and attributed greater importance to the streptococci in the causation of dental caries.

Kantorowicz,[30] Baumgartner[31] and Becker[32] concurred in this emphasis on the streptococci as a major causative agent.

Wallace[33] repeated some of Goadby's research and, in a series of experiments in 1903, corroborated Miller's contention

25. Black, G. V., An Investigation of the Physical Characters of the Human Teeth in Relation to Their Diseases, and to Practical Dental Operations, Together with the Physical Characters of Filling-Materials. *D. Cosmos* 37:353 (May) 1895.

26. Cited by Noyes, H. J., A Review of the Dental Literature on the Etiology of Dental Caries. *D. Cosmos* 71:810 (August) 1929.

27. Goadby, K. W., Micro-Organisms in Dental Caries. *Odont. Soc. Trans.* 31:225, 1898-1899.

28. Goadby, K. W., *The Mycology of the Mouth: A Text Book of Oral Bacteria.* London: Longmans, Green & Co., 1903.

29. Goadby, K. W., The Buccal Secretions and Dental Caries. *British M.J.* 2:769 (November) 1910.

30. Kantorowicz, Alfred, *Bakteriologische und histologische Studien über die Caries des Dentins.* Leipzig: Georg Thieme, 1911.

31. Baumgartner, Erich, Die Zahnkaries—eine Streptomykose. *Wiener Klinische Wochenschrift* 26:178 (January) 1913.

32. Becker, Joseph, Untersuchungen über die Zahncaries—Streptokokken und ihre Typen-Bildung. *Deutsche Monatsschrift f. Zahnheilkunde* 41:308 (May) 1923.

33. Wallace, J. S., Susceptibility and Immunity to Dental Caries. *D. Record* 23:493 (November) 1903.

that lactic acid was an end product of bacterial fermentation of carbohydrates.

Kligler[34] demonstrated to his satisfaction in 1915 that streptococci were a part of the normal flora of the mouth. Kligler's acidific organisms and Goadby's B. necrodentalis were identical with Moro's Lactobacillus acidophilus.

Howe and Hatch[35] confirmed the findings of Kligler, Goadby and the Moro-Tissier group, isolating the same gram-positive acid-producing organisms. Howe cultured protected and open cavities and found that cultures from open cavities were contaminated by streptococci and other coccal forms. Together with Hatch he listed L. acidophilus, Bacillus bifidus and B. M, X and Y as associated with caries. The last three were later considered forms of the L. acidophilus.

By this time, many investigators were noting the close relation between L. acidophilus and caries. Mackintosh, James and Lazerus-Barlow[36] also produced cultures of aciduric bacilli from carious dentin. They named the organism isolated "acidophilus odontolyticus." Two types were noted, Type II being a shorter gram-positive rod with a tendency to form chains. One type or the other was found in 96 per cent of the persons with caries. In cultures of this organism, Mackintosh, James and Lazerus-Barlow were able to produce *in vitro* caries which resembled true caries even to invasion and enlargement of dentinal tubuli. The same year, 1922, Rodriguez[37] provided similar evidence in favor of L. acidophilus and also produced caries *in vitro* in L. acidophilus cultures. He classified the organisms into three groups, the first two modeled on those of Mackintosh, James and Lazerus-Barlow and the third group similar to that of Howe and Hatch. In 1924 Clarke[38] carried out fermentation experiments and, from cultures of carious areas, found Streptococcus mutans more frequent than L. acidophilus in deep caries but a greater incidence of L. acidophilus in incipient caries. His work was repeated with the same results by MacLean[39] in 1927.

Chemical Composition of Saliva

While Goadby, Kligler, Howe and Hatch and others were investigating the bacteria involved, other men sought the answer in the chemical composition of the saliva. Both inorganic salts and their compounds and enzymatic action have been advanced as bactericidal components of saliva, but the fact still remains that bacteria can be recovered from the saliva. Kirk[40] represented the opinion of his time, 1910, when he said, "It may be assumed for the present that we are justified in our present state of knowledge in viewing immunity to carious action as being dependent upon the absence from the saliva of the kind and amount of pabulum upon which the bacteria of decay normally thrive." Prinz[41] believed that "the quantity of secreted saliva is the sole factor which governs environmental phenomena concerning tooth decay." Jones[42] attributed immunity to lack of coagulating ability of bacteria in immune mouths.

The inorganic salt content and balance in saliva and tooth structure have been considered important by several in-

34. Kligler, I. J., A Biochemical Study and Differentiation of Oral Bacteria with Special Reference to Dental Caries. *J. Allied D. Soc.* 10:141, 282, 445 (June, September, December) 1915.

35. Howe, P. R., and Hatch, Ruth E., A Study of the Micro-Organisms of Dental Caries. *D. Cosmos* 59:661 (October) 1917.

36. Mackintosh, James; James, W. W., and Lazerus-Barlow, P., An Investigation into the Etiology of Dental Caries. *Brit. D.J.* 43:728 (August) 1922; *Brit. J. Exper. Path.* 5:175 (June) 1924; 6:260 (October) 1925.

37. Rodriguez, F. E., Studies in the Specific Bacteriology of Dental Caries. *Military D. J.* 5:199 (December) 1922.

38. Clarke, J. K., Bacterial Factor in the Etiology of Dental Caries. *Brit. J. Exper. Path.* 5:141 (June) 1924.

39. MacLean, I. H., The Bacteriology of Dental Caries. *Brit. D. J.* 48:579 (May) 1927.

40. Kirk, E. C., A Consideration of the Question of Susceptibility and Immunity to Dental Caries. *D. Cosmos* 52:709 (July) 1910.

41. Prinz, Hermann, *Dental Materia Medica and Therapeutics*. St. Louis: C. V. Mosby Co., 1926 (sixth edition), pp. 293-294.

42. Jones, C. F., Some Conclusions Growing Out of a Study of the Cause of Dental Caries. *D. Rev.* 25:1167 (December) 1911.

vestigators, especially in reference to calcium and phosphorus. Pickerill[43] advanced the idea, based on his study of Maori children in 1912, that enamel went through a hardening process by absorption of lime salts from the saliva after the tooth had erupted, and he cited the permeability of this structure. Pickerill's classification of sclerotic, native and malacotic teeth, with varying degrees of hardness and caries susceptibility, was noteworthy for the group of malacotic teeth, characterized by their comparative softness and whiteness. He admitted chance of error in his findings, however, and ultimately acceded to Black's work, discussed previously.

Head,[44] Caush,[45] Pickerill,[46, 47] Von Beust[48] and Walkhoff[49] all have created a case demonstrating organic material in the enamel and at least a tendency to permeability under certain conditions and with specific stains. The possibility of interchange of calcium salts and establishment of a balance of inorganic constituents between saliva and enamel did not seem to be of major importance to the caries problem, despite the work of Pickerill and his group. In the twenties Spencer-Payne[50] thought that he had found evidence to support Pickerill but he admitted that there was not enough on which to draw definite conclusions.

The sulfocyanides, which occur in small quantities in the saliva, came in for their share of the picture. These salts, when subject to gastric digestion and to hydrochloric acid particularly, yield sulfocyanic acid, which is endowed with bactericidal properties. Lohmann[51] and Bunting[52] suggested administration of small amounts of potassium sulfocyanate as a mouthwash to serve as a prophylactic measure in caries.

The possibility of enzymatic action in saliva as a positive factor in caries control was explored by several men. In 1897, Buchner[53] discovered that fermentation was not a function of the living organism but was dependent on an enzyme system manufactured by the organism. Clark, Levine and Carter[54, 55] found a positive correlation between amylolytic action of saliva and caries: the greater the amylolytic action was, the more caries was present. Prinz[56] and Evans[57] were unable to confirm these results.

Tooth Structure Theories

By 1925 the majority of the profession had accepted Black's findings on the inviolability of chemical composition, the lack of vitality of enamel and the apparent equal susceptibility of all teeth, provided the environmental conditions were suitable. Despite overwhelming evidence to support these contentions, there are several investigators who still maintain that the Heitzmann theory is correct in its assumption of vitality of the enamel.

C. F. Bodecker is a worthy successor to his father as the outstanding proponent of enamel vitality. By means of so-called dental lymph, which is regu-

43. Pickerill, H. P., *The Prevention of Dental Caries and Oral Sepsis*. London: Bailliere, Tindall & Cox, 1912.

44. Head, Joseph, Enamel Softening and Rehardening as a Factor in Erosion. *D. Cosmos* 52:46 (January) 1910.

45. Caush, D. E., Is There Uncalcified Tissue in the Enamel? *D. Cosmos* 47:165 (February) 1905.

46. Pickerill, H. P., The Etiology of Dental Caries. *Brit. D.J.* 36:313-323, 361-385 (April) 1915.

47. Pickerill, H. P., *The Prevention of Dental Caries and Oral Sepsis*. New York: P. Hoeber, 1923 (second edition).

48. Von Beust, T. A., A Contribution to the Study of Immunity to Dental Caries. *D. Cosmos* 54:659 (June) 1912.

49. Walkhoff, O., The Structure of the Enamel and Its Significance in Caries. *D. Record* 33:660 (October) 1913.

50. Spencer-Payne, A. L., Protective Action of Saliva on the Teeth. *New Zealand D. J.* 23:132 (May) 1927-1928.

51. Lohmann, A., Significance of the Sulphocyanates in the Human Saliva. *D. Cosmos* 52:1167, 1910.

52. Bunting, R. W., Immunity and Susceptibility of the Teeth to Caries. *D. Cosmos* 54:537 (May) 1912.

53. Buchner, E., Alkoholische Garung ohne Hefezellen. *Ber. Deutsche Chem. Gesellschaft* 30:1110 (August) 1897; 31:568 (April) 1898.

54. Clark, G. W., and Levine, L., Changes in the Reaction of Resting Saliva Produced by Different Micro-Organisms. *Austral. D. Science J.* 7:413 (September) 1927.

55. Clark, G. W., and Carter, K. L., Factors Involved in the Reaction of Human Saliva. *Brit. D.J.* 48:1506, 1927.

56. Prinz, Hermann, *op. cit.*, pp. 99-91.

57. Evans, C. L., The Amylolytic Activity of Saliva *D. Cosmos* 57:226 (February) 1915.

lated by the pulp, physiologic essentials are diffused through the tubules in the dentin, along the organic matrix of the enamel rods in the enamel. Permeability can be demonstrated in newly erupted teeth, decreasing with the increasing age of the tooth, according to Bodecker.[58-64] Bibby[65-67] believed that the organic material in enamel served to resist acid destruction and lysis by aciduric bacteria. This organic content does not exceed 4.8 per cent, according to LeFevre and Manly.[68] Further, there is no correlation between enamel composition and the extent of caries or between caries and calcium, phosphorus and carbon dioxide in the dentin. "The residual organic fibrils which pass from enamel cuticle through interprismatic enamel-substance facilitate percolation of acid from surface to dentin."[69] In this manner Wallace corroborates Bodecker's recognition of organic content in the enamel and at the same time denies Bibby's conclusions. A more effective summary of the importance of the organic component in enamel is that of Bibby[70] in the symposium of the Good Teeth Council for Children, Inc.:

> It is obvious . . . that we have very little exact information regarding the organic structures of the dental enamel. Since the one fact we know about them is that they constitute only a relatively small portion of the total of the enamel, it seems unwise to attribute too much of either an active or passive function to them.

Representative of the European thought on the importance of tooth structure in the causation of dental caries are the opinions of Gottlieb and Orban. Gottlieb[71] said: "The degree of calcification of the dental hard-tissues plays an important but not decisive role in the etiology of caries. Lamellae are paths of transmission of caries into enamel and the underlying dentin because they do not become calcified." Orban[72] agrees essentially with Gottlieb: "The incidence of caries is not primarily dependent upon structural deficiency of a tooth, but such deficiency may accelerate the carious process." Schour[73] corroborates this view with his work on calcium metabolism of dental structures. His conclusion that the calcified structure of a tooth has no correlation with caries is substantiated by experiments which proved that there was no withdrawal or deposition of calcium after tooth formation.

Caries and Mottling

The question of the relative caries susceptibility of mottled and hypoplastic enamel as compared with normal tooth structure has elicited no little work—with divergent opinion. At present the majority of investigators believe that there is no appreciable difference but that there is a slight tendency to a greater resistance to caries in normal teeth. These opinions are based on the work of Applebaum and the Columbia

58. Bodecker, C. F., Three Proofs of the Organic Nature of the Human Adult Enamel. *J.A.D.A.* 10:1164 (December) 1923.
59. Bodecker, C. F., and Gies, W. J., Histochemical Proof of the Presence of Protein Matter in Dental Enamel. *Proc. Soc. Exper. Biol. & Med.* 22:175 (December) 1924.
60. Bodecker, C. F., and Gies, W. J., Histochemical Proof of the Presence of Protein Matter in Dental Enamel. *D. Cosmos* 67:826 (August) 1925.
61. Bodecker, C. F., Variations in the Lesions and Activity of Dental Caries. *J. D. Res.* 16:51 (February) 1937.
62. Bodecker, C. F., and Lefkowitz, William, Concerning the "Vitality" of the Calcified Dental Tissues. *J. D. Res.* 16:463 (December) 1937.
63. Bodecker, C. F., and Lefkowitz, William, Concerning the Vitality of the Calcified Dental Tissues. II. *J. D. Res.* 17:453 (December) 1938.
64. Bodecker, C. F., and Ewen, Sol, The Incidence of Unilateral Dental Caries in 516 Cases. *J. D. Res.* 16:401 (October) 1937.
65. Bibby, B. G., The Organic Structure of Dental Enamel as a Passive Defense Against Caries. *J. D. Res.* 12:99 (February) 1932.
66. Bibby, B. G., and Van Huysen, Grant, Changes on the Enamel Surface, A Possible Defense Against Dental Caries. *J.A.D.A.* 20:808 (May) 1933.
67. Bibby, B. G., 12 Studies of Variation in the Nature of Enamel Surface. *J. Am. Col. Den.* 2:118 (April-July) 1936.
68. LeFevre, M. L., and Manly, R. S., Moisture, Inorganic and Organic Contents of Enamel and Dentin from Carious Teeth. *J.A.D.A.* 25:233 (February) 1938.
69. Wallace, J. S., cited in *Dental Caries.* American Dental Association: 1941 (second edition), pp. 228-229.
70. Bibby, B. G., cited in *The Cause and Prevention of Dental Caries.* Chicago: Good Teeth Council for Children, Inc., 1938, p. 27.
71. Gottlieb, Bernhard, cited in *Dental Caries.* American Dental Association, 1941 (second edition), p. 111.
72. Orban, Balint, cited in *Dental Caries.* American Dental Association, 1941 (second edition), p. 185.
73. Schour, Isaac, Calcium Metabolism and Teeth. *J.A.M.A.* 110:870 (March 19) 1938.

group,[74] Atkins, [75] Dean,[76] McKay[77] and Piperno.[78] The initial reaction against caries is greater in mottled teeth, but once caries has started it spreads more rapidly. Whereas Agnew[79] believed that fluorine and mottled enamel had no appreciable effect on caries incidence among the Chinese, most other investigators have noted a definite inhibiting factor (Dean,[80] Bibby,[81] Cheyne,[82] Cox,[83] McClendon[84] and others). The work of the United States Public Health Service under Dean deserves special consideration. Eight communities around Chicago, with varying amounts of fluorine in the water, were selected, and the number of children with carious teeth was determined. In Waukegan, Oak Park and Evanston, with fluorine-free water supplies, the carious permanent teeth per hundred children examined were 810, 722 and 673, respectively. In Aurora, Maywood and Elmhurst the number of carious permanent teeth amounted to only 281, 258 and 252, respectively. These figures are significant.[85]

The optimum of 1 part per million of fluorine in drinking water seems to ensure a relatively low incidence of caries and still does not cause mottling of the enamel. The ability of enamel to absorb, or combine with, fluorine compounds has been noted by Armstrong.[86] Mature rats' teeth immersed for sixty days in water containing 20 parts per million of fluorine showed an increase of 36 per cent of fluorine in the enamel. Fosdick noted the forming of fluorine compounds on the surface of enamel, with increased insolubility of the fluoride in acid as the probable cause of the decrease in caries. Whether there is absorption of fluorine elements owing to the permeability of the enamel or actual combination, the fact that fluoride ions are held on the surface of the enamel in readiness to inhibit enzyme action and hydrolysis is significant.

For those who see in bone flour and other fluoride compounds a panacea to cure dental caries, the following quotation is in order:

> Mottled teeth, which may be more resistant than normal teeth to the onset of caries, are structurally weak. Caries once started in mottled teeth extends rapidly. These conditions suggest caution in attempts to build caries-resistance into teeth by addition of fluoride to public water-supplies as a public health procedure. Although fluoride ingestion during the period of tooth formation may produce teeth having increased resistance to bacterial invasion, the deficiences of the ensuing poorly constructed, internally weak, mottled teeth nullify this advantage.[87]

The possibility of remineralization of enamel has been discussed to some extent. Gore[88] noted a positive correlation between calcium and phosphate ions in the saliva and remineralization of the enamel; the more calcium and phosphorus ions, the more remineralization, and the areas of remineralization are more resistant to caries. Gysi[89] said that "permanent mineralization may be secured only with saliva of optimal qual-

74. Applebaum, Edmund, cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 39.
75. Atkins, A. P., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 43.
76. Dean, H. T., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 95.
77. McKay, F. S., The Establishment of a Definite Relation Between Enamel That Is Defective in Its Structure, as Mottled Enamel, and the Liability to Decay. *D. Cosmos* 71:747 (August) 1929.
78. Piperno, Arrigo, cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 171. 190-191.
79. Agnew, R. G., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 35.
80. Dean, H. T., cited in *Dental Caries*. American Dental Association, 1941 (second edition), pp. 93-94.
81. Bibby, B. G., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 52.
82. Cheyne, V. D., cited in *Dental Caries*. American Dental Association, 1941 (second edition), pp. 80-82.
83. Cox, G. J., cited in *Dental Caries*. American Dental Association, 1941 (second edition), pp. 86-87.
84. McClendon, J. F., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 171.
85. Dean, H. T., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 95.
86. Armstrong, W. D., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 39.
87. Smith, Margaret C., and Smith, H. V., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 210.
88. Gore, J. T., cited in *Dental Caries*. American Dental Association, 1941 (second edition), pp. 110-111.
89. Gysi, Alfred, cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 115.

ity." Similarly, Turkheim[90] reported that "some of the salient factors in the composition of saliva are osmotic pressure, pH, calcium content, capability to nourish bacteria, power to remineralize enamel and dentin." On the other side are arguments put forth by such men as Belding and Applebaum. "Formed enamel cannot be altered by dietary means, . . . there is no physiologic mechanism by which calcium can be abstracted from, or deposited in, formed enamel."[91] Applebaum's[92] roentgen ray and grenz ray studies of carious teeth also indicate that there is no remineralization of enamel, at least in incipient caries.

It would seem, from the foregoing contributions, that, despite varying conclusions on organic and inorganic constituents of enamel, mottled and defective surfaces of teeth and possibilities of remineralization of decalcified regions, the tooth structure, in itself, is only of secondary importance in the caries picture and does not seem to offer too much hope to investigators in the future as far as a solution of the caries problem is concerned.

Bacterial Theories

The year 1925 saw Bunting and Palmerlee[93] running cultures to determine the correlation between L. acidophilus and caries. They found L. acidophilus present in 100 per cent of 38 cases of beginning cervical caries. There were fifteen positive cultures of L. acidophilus out of 16 cases of deep advanced caries. Only 3 out of 19 caries-immune patients yielded positive L. acidophilus cultures.

Subsequent experiments by Bunting and his collaborators confirmed preliminary findings on the close correlation between L. acidophilus and the incidence of dental caries. Production of caries *in vivo* by means of isolating bacteria under gold cups placed against enamel surfaces was done successfully. In succeeding investigations on thousands of cases Bunting and his group[94-98] showed that if L. acidophilus was not the causative agent, at least it was present in the majority of cases. There was positive correlation between the number of bacilli and the susceptibility to caries. The Michigan group of Bunting, Jay, Esser, Hadley and Crowley[99-101] also studied the effects of diet on L. acidophilus counts and found methods of recognizing the L. acidophilus, immunologic reactions and the method of determining L. acidophilus in the saliva. This last problem was difficult, necessitating much work with cultures and broths.

In 1927 Jay and Voorhees[102] found that in caries-free mouths L. acidophilus was consistently absent but could be isolated equally consistently from susceptible mouths. They noted that the presence of L. acidophilus preceded, by two or three months, caries activity which manifested itself clinically. The same results were obtained by Enright, Friesell

90. Turkheim, H. J., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 223.
91. Belding, P. H., and Belding, L. J., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 48.
92. Applebaum, Edmund, cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 39.
93. Bunting, R. W., and Palmerlee, Faith, The Role of Bacillus Acidophilus in Dental Caries. *J.A.D.A.* 12:381 (April) 1925.
94. Bunting, R. W., and others, The Prevention of Dental Caries Through the Limitation of the Growth of Bacillus Acidophilus in the Mouth. *J.A.D.A.* 16:224 (February) 1929.
95. Bunting, R. W.; Nickerson, Gail, and Hard, D. G., Further Studies of the Relationship of Bacillus Acidophilus to Dental Caries. *D. Cosmos* 68:931 (October) 1926.
96. Hadley, Faith P.; Bunting, R. W., and Delves, Edna A., Recognition of Bacillus Acidophilus Associated with Dental Caries: A Preliminary Report. *J.A.D.A.* 17:2041 (November) 1930.
97. Jay, Philip; Crowley, Mary C., and Bunting, R. W., Preliminary Studies on the Immunology of Dental Caries. *J.A.D.A.* 19:265 (February) 1932.
98. Jay, Philip; Crowley, Mary C., and Bunting, R. W., The Relationship of the Occurrence of Bacillus Acidophilus in Humans to Skin Sensitivity and Specific Agglutinins in Blood Serum. *J.D. Res.* 12:429 (June) 1932.
99. Jay, Philip, and others, Bacteriologic and Immunologic Studies on Dental Caries. *J.A.D.A.* 20:2130 (December) 1933.
100. Jay, Philip, and others, Observations on Relationship of Lactobacillus Acidophilus to Dental Caries in Children During Experimental Feeding of Candy. *J.A.D.A.* 23:846 (May) 1936.
101. Jay, Philip, and Esser, Ann, Further Studies of the Etiology and Control of Dental Caries. *J.A.D.A.* 17:1117 (June) 1930.
102. Jay, Philip, and Voorhees, R. S., Bacillus Acidophilus and Dental Caries. *D. Cosmos* 69:977 (October) 1927.

and Trescher[103] in 1932. Hollander,[104] of the Columbia group, found L. acidophilus present in all carious mouths, producing a pH as low as 3.5. Other acidogenic bacteria produced a pH of 4.5, but enamel was found to be five times as soluble at a pH of 3.5 as at 4.5. Jay and Voorhees[105] carried their studies further and in 1929 modified their earlier findings by stating that L. acidophilus did appear occasionally in caries-free mouths but was eliminated rapidly by salivary inhibitors. Bunting[106] wrote in 1932:

> The active cause of dental caries is a specific type of bacterium, which inhabits the mouth of certain individuals, but is absent, or present only in small numbers, in persons who have little or no caries. Organisms attack the teeth through the actions of acids formed in the fermentation of carbohydrate food stuffs retained in the mouth. It belongs to the lactobacillus group of bacteria and is generally known as B. acidophilus.

With a wide acceptance of L. acidophilus as the causative agent in caries, methods of determination were developed. In 1930 Rodriguez[107] worked out a system, and in the same year Howitt and Fleming[108] devised a method of quantitative determination of L. acidophilus. Hadley[109] in 1933 combined several methods. By modification of Kulp's tomato agar, direct correlation between counts of L. acidophilus and activity of dental caries was noted, and this culturing method was used in subsequent work by the Michigan group. In addition, correlation between L. acidophilus and ingested carbohydrate was seen. Attempts by these investigators to implant L. acidophilus in immune mouths did not meet with success, a fact which suggested that bacterial inhibiting factors were present in the saliva.[100]

Nature of Oral Bacteria

Still unsolved for a number of investigators is the exact nature of the bacteria involved in caries. Numerous studies have been made, several of which compare intestinal flora with oral flora. Anderson[110] found in his studies that changes in salivary pH and in the number of L. acidophilus in the mouth were reflected in alterations in colonic bacteria. In 1937 Anderson and Rettger[111] conducted research on the specificity of oral flora and concluded that the oral and intestinal strains were not the same species or type. Rosebury and his coworkers[112] have not been able to note any distinguishing features between intestinal and oral strains.

One of the more significant trends in the study of the bacteriologic aspect in the last twenty years has been to substantiate earlier work of Goadby and Kligler. Despite assertions on the part of the Michigan school that L. acidophilus is the sole etiologic agent, other investigators have found what they consider proof of acidogenic action of other oral flora, equally effective or more so than L. acidophilus. Acceptance of symbiosis of acidogenic oral bacteria is the logical conclusion of the work of

103. Enright, J. J.; Friesell, H. E., and Trescher, M. O., Study of the Cause and Nature of Dental Caries. *J. D. Res.* 12:759 (October) 1932.

104. Hollander, Franklin, Coordinated Report of the Columbia University Dental Caries Research Group. *J. D. Res.* 14:303 (August) 1934.

105. Jay, Philip, and Voorhees, R. S., The Bacteriology of Dental Caries with Special Reference to Bacillus Acidophilus. *J.A.D.A.* 16:2054 (November) 1929.

106. Bunting, R. W., A Review of Recent Researches on Dental Caries. *J.A.D.A.* 18:785 (May) 1931.

107. Rodriguez, F. E., A Method of Determining, Quantitatively, the Incidence of Lactobacillus Acidophilus Odontolyticus in the Oral Cavity. *J.A.D.A.* 17:1711 (September) 1930.

108. Howitt, B. A., and Fleming, W. C., A Quantitative Examination of the Mouth Flora Under Different Dietary Conditions. *J. D. Res.* 10:33 (February) 1930.

109. Hadley, Faith P., A Quantitative Method for Estimating Bacillus Acidophilus in Saliva. *J. D. Res.* 13:415 (October) 1933.

110. Anderson, T. S., and Linfoot, Sydney, cited in *Dental Caries.* American Dental Association, 1941 (second edition), pp. 37-38.

111. Anderson, T. G., and Rettger, L. F., Acidogenic and Aciduric Bacteria of the Mouth and Their Possible Relation to Dental Caries. *J. D. Res.* 16:489 (December) 1937.

112. Rosebury, Theodor, cited in *Dental Caries.* American Dental Association, 1941 (second edition), p. 200.

Lyons,[113-115] Tunnicliff and Hammond,[116] and Fosdick and Hansen.[117] Lyons listed various types of cocci and bacilli as well as the L. acidophilus. Particularly of note is the acid streptococcus, which he claims is predominant throughout adult life. Symbiosis of the various strains produces acetic, butyric, citric, formic, oxalic, proprionic, pyruvic and succinic acids as well as lactic acid. Tunnicliff and Hammond's findings also reflect increased recognition of the acid streptococcus:

> In natural human caries, cocci are the predominating, and often the only organisms in the tubules. This fact indicates that cocci are the invading organisms in caries, irrespective of predisposing factors. . . . The organisms . . . appear to correspond to cocci, bacilli and "tortuous threads" described by Miller in tubules of carious teeth.[116]

Anderson and Rettger[111] also placed primary importance on the acid streptococcus. Hine[118] examined forty-one teeth with deep caries and found a mixed flora in every tooth, and he concluded that any acidogenic bacteria can produce caries. Bibby, Volker and Van Kesteren[119] found that:

> Cultured estimates of the number of acidogenic organisms in saliva from mouths with active caries indicated that lactobacilli were a minor constituent of the oral flora. Comparison of the rate of acid formation by various mouth organisms showed that streptococci and actinomyces-like organisms formed acid most rapidly, and that lactobacilli and other organisms were less active in this respect. Some streptococcal strains formed acids more rapidly than others.

Thus the view of the Rochester, N. Y., group is essentially the same as that of Hine.

The work of Fosdick and his co-workers will be considered in more detail under salivary and chemical aspects, but these investigators found that, by using pure cultures of yeast and L. acidophilus, a larger amount of enamel could be dissolved than by using L. acidophilus alone. Yeast organisms were recovered from saliva allowed to stand unpreserved, and the saliva imparted a characteristic yeast odor. In succeeding investigations the Northwestern group through much chemical and bacteriologic research evolved the theory that caries is due to a combination of organisms in symbiosis. By a combination of the enzyme systems of these bacteria, the pH could be dropped rapidly from pH 7.0 to pH 4.0 in three minutes. The crux of the situation seems to be not how low a pH a bacterial strain will tolerate or influence but how rapidly it will form acid. Both acid streptococcus and L. acidophilus tolerate a pH of 4.0, but the streptococcus produces acid more rapidly and hence will be the organism which dissolves the tooth.

The last twenty years have not provided a solution to the plaque controversy. "Plaques consist predominantly of filamentous microorganisms intermeshed in a matlike structure, the interstices of which are more or less filled with bacteria and occasional epithelial cells."[120] Hanke observed that plaques are analogous to blotters, holding sugars and acids in contact with the enamel. He noted the odor of butyric acid often given off by plaques and suggested mouthwashes of mercurials to neutralize acids in plaques as a caries preventive. Blayney[121] wrote:

113. Lyons, D. C., Relation of Certain Aciduric Bacteria and Certain Food Elements to Dental Caries. *J.A.D.A.* 22:409 (March) 1935.
114. Lyons, D. C., Laboratory Evidence of the Antibiotic Relationship of Mouth Inhabiting Bacteria. *J.A.D.A.* 23:832 (May) 1936.
115. Lyons, D. C., Evidence of the Hereditary Factor in Opalescent Dentin. *J.A.D.A.* 27:1281 (August) 1940.
116. Tunnicliff, Ruth, and Hammond, Carolyn, cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 222.
117. Fosdick, L. S., and Hansen, H. L., Theoretical Considerations of Carbohydrate Degradation in Relation to Dental Caries. *J.A.D.A.* 23:401 (March) 1936.
118. Hine, M. K., Bacteria and Dental Caries. *J.A.D.A.* 24:97 (January) 1937.
119. Bibby, B. G.; Volker, J. F., and Van Kesteren, M., Acid Production and Tooth Decalcification by Oral Bacteria. *J. D. Res.* 21:61 (February) 1942.
120. Hanke, M. T., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 117.
121. Blayney, J. R., cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 55.

Bacterial plaques occur alike over carious and noncarious areas of human teeth. When freed from saliva, and examined independently for presence of lactobacillus-like forms in stained smear preparations and for growth of lactobacilli in culture, plaque material yielded a high correlation (83.5 percent agreement) between these two methods of laboratory diagnosis. . . . It is possible, by clinical examination, to determine the presence or absence of early carious changes under plaques and, by appropriately spaced subsequent examinations, to demonstrate presence or absence of caries activity.

Fosdick[122] pointed to the excellent buffering qualities of plaques, in themselves, and to the existence of plaques in immune and caries-susceptible mouths alike. He believed that plaques are a definite protective mechanism, except where they break down in isolated areas, and that they utilize their buffering capacity to the fullest and then act as a sponge, holding sugars and acids against the tooth. This statement describes rather well our knowledge on plaques at present.

To summarize bacteriologic contributions in the last twenty years: Our knowledge is essentially the same as it was in 1925, with the greatest efforts in refinement of technic. Despite constant effort to uncover some single causative agent, the theories of Miller, Black and Williams are essentially our basis of consideration. L. acidophilus definitely has been established as closely associated with carious lesions and is present in practically all clinical analyses of caries, but it remains for someone to provide definite information that it is the sole bacteriologic factor. The thesis that a number of acidogenic bacteria act in symbiosis through enzymes liberated by these bacteria seems most tenable in the light of tooth structure and the chemical information which is available at present.

122. Fosdick, L. S., Etiology of Caries. Personal communication (September 6, 1945).

Salivary and Chemical Theories

The most concerted effort in the last twenty years has been in the biochemical approaches to the caries problem. The hypothesis of bacterial action on carbohydrate pabulum is accepted, and the chemist takes up from there. Salivary analysis is the logical starting point. As the environment of the tooth, it has a prominent role in the caries picture. Grossman and Brickman[123] pointed out that normal saliva varies from time to time in the individual, that nocturnal pH is lower than diurnal and that the pH in carious groups generally is lower than the pH in caries-free groups. In 1936 Karshan[124] published the results of a long series of experiments on the nature of saliva. His complete analysis is given in the accompanying table.

Fosdick[122] gave the following composition of saliva, listing trace elements. Water makes up over 98 per cent, and solid particles 306 to 860 mg. per hundred cubic centimeters.

Calcium 4-10	NH_3 5-25
Phosphorus 10-30	Urea 0-7
Chlorides 30-60	Uric Acid .5-3
CO_3 55-125	Traces
Mg 1.29	Catalase
CNS 0-30	Maltase
K 55	Ptyalin
Protein 200-400	Urease
Mucin .25	Protease
NPN 5-25	Phosphatase

Calcium and Phosphorus in Saliva

With so many elements making up its buffering capacity, it is easy to see why saliva has been blamed for helping or hindering the carious processes. The calcium and phosphorus content has been analyzed by a number of men. It took some time to settle whether or not there was any positive correlation between cal-

123. Grossman, L. I., and Brickman, B. M., Some Observations on the pH of Saliva. *J. D. Res.* 16:409 (October) 1937.

124. Karshan, Maxwell, Factors in Human Saliva Correlated with the Presence and Activity of Dental Caries. *J. D. Res.* 15:383 (December) 1936.

Analysis of the components of saliva (data taken from Karshan[124])

Class of value	Group	Number of cases	Number of analyses	Group mean (M)	Standard deviation	Standard deviation of mean	Class mean (M_0)	Standard deviation of class mean	Difference of means (D)	Standard deviation of difference (σ_D)	$\frac{D}{\sigma_D}$	Odds against random occurrence of difference
Ca, mgm. %	Caries-free	22	64	6.1	1.1	0.22	5.6	0.09	+0.5	0.24	2.1	27 to 1
	Arrested-caries	15	35	6.1	0.9	0.22	—	—	+0.5	0.24	2.1	27 to 1
	Active-caries	41	104	5.3	0.7	0.12	—	—	−0.3	0.15	2.0	21 to 1
	Miscellaneous	27	66	5.3	0.7	0.14	—	—	−0.3	0.17	1.8	13 to 1
Inorganic phosphate, mgm. %	Caries-free	22	64	13.4	1.9	0.41	13.1	0.21	+0.3	0.46	0.7	1 to 1
	Arrested-caries	15	35	13.9	1.7	0.45	—	—	+0.8	0.50	1.6	8 to 1
	Active-caries	41	104	12.2	2.0	0.32	—	—	−0.9	0.38	2.4	60 to 1
	Miscellaneous	27	67	13.6	2.3	0.46	—	—	+0.5	0.51	1.0	2 to 1
Ca removed, %	Caries-free	22	63	65	10	2.2	52	1.9	+13	2.9	4.9	$>10^5$ to 1
	Arrested-caries	15	35	68	6	1.5	—	—	+16	2.4	6.7	$>10^{11}$ to 1
	Active-caries	41	103	43	17	2.7	—	—	−9	3.3	2.7	143 to 1
	Miscellaneous	27	66	46	22	4.4	—	—	−6	4.9	1.2	3 to 1
Phosphate removed, %	Caries-free	22	64	18	16	3.6	34	1.8	−16	4.0	4.0	15,770 to 1
	Arrested-caries	15	35	21	17	4.3	—	—	−13	4.7	2.8	195 to 1
	Active-caries	41	103	44	13	2.0	—	—	+10	2.7	3.7	4,637 to 1
	Miscellaneous	27	67	40	16	3.2	—	—	+6	3.7	1.6	8 to 1
CO_2 capacity, volume %	Caries-free	22	64	31.1	7.6	1.7	23.8	0.84	+7.3	1.9	3.8	6,915 to 1
	Arrested-caries	15	35	30.2	7.4	2.0	—	—	+6.4	2.2	2.9	267 to 1
	Active-caries	41	104	19.5	6.6	1.0	—	—	−4.3	1.3	3.3	1,033 to 1
	Miscellaneous	27	65	20.8	6.1	1.2	—	—	−3.0	1.5	2.0	21 to 1
Protein, mgm. %	Caries-free	22	62	266	44	9.6	286	6.3	−20	11.5	1.7	10 to 1
	Arrested-caries	15	35	285	51	13.5	—	—	−1	14.9	0.1	<1 to 1
	Active-caries	39	100	283	52	8.5	—	—	−3	10.6	0.3	<1 to 1
	Miscellaneous	26	61	310	85	17.2	—	—	+24	18.3	1.3	4 to 1
Protein removed, %	Caries-free	22	62	50	11	2.5	54	0.83	−4	2.6	1.5	6 to 1
	Arrested-caries	15	35	52	6	1.5	—	—	−2	1.7	1.2	3 to 1
	Active-caries	39	99	56	7	1.2	—	—	+2	1.5	1.3	4 to 1
	Miscellaneous	26	61	55	7	1.4	—	—	+1	1.6	0.6	1 to 1
Ammonia N, mgm. %	Caries-free	13	34	3.9	1.8	0.52	4.8	0.89	−0.9	1.0	0.9	2 to 1
	Arrested-caries	—	—	—	—	—	—	—	—	—	—	—
	Active-caries	27	58	5.2	1.9	0.38	—	—	+0.4	1.0	0.4	<1 to 1
	Miscellaneous	14	26	5.0	2.2	0.60	—	—	+0.2	1.1	0.2	<1 to 1

cium and phosphorus content and caries immunity, if it can be assumed that the problem has been settled. Bunting changed from a position supporting definite correlation in 1915[125, 126] to one in which these ions were discounted in the general picture.[127] In 1925 the tendency was strong among many investigators to discount any appreciable correlation of calcium and immunity.[128-131] There was wide disagreement on salivary phosphate content and dental caries. In 1929 Horton, Marrack and Price[132] produced results showing a positive calcium correlation but no correlation for phosphate factors.

Hawkins[133] found lower phosphate content in caries-free persons. The Columbia group[127, 134-136] began a series of experiments in 1931 on this subject. Their initial results showed a slight positive correlation of higher calcium and phosphate with immune persons, but these figures were thought to be not significant. In 1934, Rosebury, Karshan and Foley[137] studied the relation of pH, calcium and phosphorus to the solubility of enamel. They found that, in lactate buffers, changes in pH in each time level were strictly proportional to the dissolved phosphorus at that level. Enamel was found to be soluble over the entire acid pH range. Dissolved phosphorus, plotted against pH, both at equilibrium, changed direction between pH 5.0 and pH 4.0. By 1936 Karshan[124, 138] finished a more complete set of experiments and demonstrated definite correlation; he has been able constantly to strengthen his case, despite contradictory findings by Becks, Wainwright and Young.[139, 140] Summarizing the results obtained, covering a period of ten years, Karshan[141] wrote:

> Salivary levels of calcium, inorganic phosphate, H-ion concentration, titratable alkalinity and CO_2-capacity affect the destruction or solution of enamel by acids. The findings indicate that salivas of persons free from caries provide greater protection, against solution of enamel by acids and hence against caries, than salivas of persons having active caries. Normal levels of calcium and inorganic phosphate in blood serum indicate that there is no apparent deficiency in the mechanism of calcification in individuals having active caries. Normal levels of H-ion concentration, CO_2-content and CO_2-capacity, in blood plasma of persons having active caries, indicate that caries is not associated with acidosis or alkalosis. Although no correlation has been found between composition of aqueous extracts of enamel or of dentin and condition of teeth, such extracts of enamel or dentin contain small amounts of calcium, phosphate, sodium and CO_2-yielding material which could not be due to solution of contained apatite salts. Possibly these salts act as metabolites.

Hubbell[136] had found carbon dioxide

125. Bunting, R. W., and Rickert, U. G., Dental Caries. *J.A.D.A.* 2:247 (August) 1915.
126. Bunting, R. W., and Wixon, Florence H., Dental Caries. *J.A.D.A.* 4:81 (January) 1917.
127. Bunting, R. W., and Hubbell, Rebecca B., Calcium and Phosphorus of Saliva in Relation to Dental Caries. *J. Nutrition* 5:509 (November) 1932.
128. Spencer-Payne, A. L., Saliva—Its Protective Action upon the Teeth. *Brit. D. J.* 45:1636 (December) 1924.
129. Clark, G. W., and Levine, L., Inorganic Constituents of Human Saliva. *Am. J. Physiol.* 81:264 (July) 1927.
130. Clark, G. W., and Carter, K. L., Factors Involved in Reaction Changes of Human Saliva. *J. Biol. Chem.* 73:301 (June) 1927.
131. Leonard, H. J., The Causes of Variation in Salivary Calcium; Their Relation to Susceptibility and Immunity to Dental Caries. *J.A.D.A.* 15:1530 (August) 1928.
132. Horton, K.; Marrack, J., and Price, I., Relation of Calcium in Saliva to Dental Caries. *Biochem. J.* 23:1075 (March) 1929.
133. Hawkins, H. F., A Rational Technique for the Control of Caries and Systemic Pyorrhea. *J. D. Res.* 11:201 (April) 1931.
134. Karshan, Maxwell; Krasnow, Frances, and Krejci, Laura E., A Study of Blood and Saliva in Relation to Immunity and Susceptibility to Dental Caries. *J. D. Res.* 11:573 (August) 1931.
135. Krasnow, Frances, Biochemical Studies of Dental Caries: Diurnal Variations in the Phosphorus, Calcium, Hydrogen-Ion Concentration, and Titratable Alkalinity. *J. D. Res.* 12:530 (June) 1932.
136. Hubbell, Rebecca B., Chemical Composition of Saliva and Blood Serum of Children in Relation to Dental Caries. *Am. J. Physiol.* 105:456 (August) 1933.
137. Rosebury, Theodor; Karshan, Maxwell, and Foley, Genevieve, Studies in the Rat of Susceptibility to Dental Caries: A Review of Four Years of Research. *J.A.D.A.* 22:98 (January) 1935.
138. Karshan, Maxwell, Factors in Saliva Correlated with Dental Caries. *J. D. Res.* 18:395 (October) 1939.
139. Becks, H.; Wainwright, W. W., and Young, D. H., Does Salivary Calcium and Phosphorus Composition Differ Significantly in Caries-Free and Caries-Active Individuals? *J. D. Res.* 20:171 (June) 1941.
140. Becks, H., and Wainwright, W. W., The Effect of Flavored Activators on Salivary Flow and Calcium and Phosphorus Composition. *J. D. Res.* 21:87 (February) 1942.
141. Karshan, Maxwell, cited in *Dental Caries*. American Dental Association, 1941 (second edition), p. 144.

capacity higher in groups of immune children than in susceptible children, with a mean difference of 44 per cent and a demonstrable positive titratable alkalinity correlation. Marshall[142] had first noted this higher titratable alkalinity in immune persons in 1915 but had been contradicted by Gies and Shepard.[143] Jay, Hadley, Bunting and Koehne[144] repeated Hubbell's experiments and were unable to draw a consistent relation between carbon dioxide and caries. Fosdick, Campaigne, Hansen and Epple[145, 146] corroborated Karshan's results.

Further Salivary Analysis

Grove and Grove[147] found distinct differences between the amounts of ammonia in caries-immune saliva and caries-susceptible saliva. The ammonia in caries-susceptible saliva ranged from traces to 8 mg. per 100 cc.; caries-free saliva contained 8 to 20 mg. per 100 cc. White and Bunting,[148] using the Folin-Bell colorimetric method, could not confirm these findings.

Florestano, Faber and James[149] studied 166 cases of caries and, using a starch iodine reaction as an index, found a relation between the diastatic index and the amount of caries. This work was repeated by Turner and Crane[150] with similar results. Hubbell[136] had noted no correlation in her work in 1933.

The role of ptyalin has also been studied, with varied results. Cheyne[151] recognized existence of caries-inhibitor factors in saliva but believed that ptyalin had no significance. Hawkins[152] credited ptyalin with prevention of caries by means of its quick conversion of starches into sugar. Fosdick and Rapp[153] found that a high ptyalin index gave more rapid acid production, as did a high amount of pancreatic amylase.

On the other side, Boyd, Drain and Brauer[154] saw no correlation between chemical analysis and activity or inactivity of caries. Bibby[119] also noted the lack of difference in the inhibitory powers of caries-susceptible and caries-immune saliva. Dean[155] listed twelve properties of saliva that he believed had no significance in the general caries picture: (1) total solids, (2) loss of ignition (organic matter), (3) ash, (4) percentage of ash in total solids, (5) total nitrogen, (6) percentage of nitrogen in total solids, (7) ammonia N, (8) total N minus ammonia N, (9) corrected N in organic matter, (10) pH of isoelectric zone, (11) oxygen consumed from permanganate and (12) oxygen consumed from permanganate per milligram of organic matter in saliva.

Research in the direction of phosphatase as a controlling factor in caries has led to inconclusive results. Fosdick at-

142. Marshall, J. A., The Technique Involved in the Determination of the Salivary Factor. *Pacific D. Gaz.* 23:335 (June) 1915.

143. Gies, W. J., and Shepard, L. A., On the Validity of Marshall's "Salivary Factor" for the Biochemical Determination of Susceptibility to, or Immunity from, Dental Caries. *J. Allied D. Soc.* 11:275 (June) 1916.

144. Jay, Philip; Hadley, Faith P.; Bunting, R. W., and Koehne, Martha, Observations on Relationship of Lactobacillus Acidophilus to Dental Caries in Children During Experimental Feeding of Candy. *J.A.D.A.* 23: 846 (May) 1936.

145. Fosdick, L. S., and Campaigne, E. E., Some Chemical Differences Between the Saliva of Caries-Immune and That of Caries-Susceptible Patients. *J.A.D.A.* 26:954 (June) 1939.

146. Fosdick, L. S.; Hansen, H. L., and Epple, Charlotte, Enamel Decalcification by Mouth Organisms and Dental Caries: A Suggested Test for Caries Susceptibility. *J.A.D.A.* 24:1275 (August) 1937.

147. Grove, C. T., and Grove, C. J., The Biochemical Aspect of Dental Caries. *D. Cosmos* 76:1029 (October) 1934.

148. White, Julius, and Bunting, R. W., An Investigation into the Possible Relationship of Ammonia in the Saliva to Dental Caries. *J.A.D.A.* 22:468 (March) 1935.

149. Florestano, H. J.; Faber, J. E., and James, L. H., Studies on the Relationship Between Diastatic Activity of Saliva and Incidence of Dental Caries. *J.A.D.A.* 28:1799 (November) 1941.

150. Turner, Naomi C., and Crane, F. M., A Relationship Between Caries and Saliva. *J. D. Res.* 23:413 (December) 1944.

151. Cheyne, V. D., cited in *Dental Caries.* American Dental Association, 1941 (second edition), p. 80.

152. Hawkins, H. F., cited in *Dental Caries.* American Dental Association, 1941 (second edition), p. 121.

153. Fosdick, L. S., and Rapp, G. W., The Effect of Amylolytic Enzymes on Acid Production in Saliva. *J. D. Res.* 23:85 (April) 1944.

154. Boyd, J. D.; Drain, C. L., and Brauer, J. C., cited in *Dental Caries.* American Dental Association, 1941 (second edition), p. 64.

155. Dean, H. T., cited in *Dental Caries.* American Dental Association, 1941 (second edition), p. 92.

tached importance to phosphatase in carbohydrate degradation.[156] With Campaigne[145] he found that the buffering capacity of caries-immune saliva was 40 per cent higher than that of caries-susceptible saliva. Shafer[157] found a trend toward a positive correlation of caries and the phosphatase index, but exceptions were frequent and differences variable, with no significant unconditional trends.

The phosphatase experiments pointed the way to a study of tissue enzymes in general. Some men have thought that tissue enzymes influence carious processes. In 1929 Gies[158] wrote, "Conventional tests for tissue enzymes, applied to pulverized enamel from freshly extracted teeth, have been completely negative." This is essentially the situation today, and much work has been done since the observation by Gies. Whether bacterial enzymes are supplemented by tissue enzymes or inhibited by them is not known. Their possible effect should not be discounted.

Salivary Flow

Flow of saliva, especially as it serves as a carrying agent for buffering essentials, is of no little importance. Becks[159] wrote in 1938:

> It has been a common clinical observation that the rate of flow of mixed human saliva varies greatly. We find some persons with an extremely slow and others with an extremely fast rate of flow under resting conditions. Whether one or the other has a more beneficial or detrimental effect on the dental structure is still unknown.

Trimble, Etherington and Losch[160] attached major importance to salivary flow. Caries-susceptible persons had much less salivary flow than did caries-immune persons. Karshan[161] did not corroborate the big variation in salivary flow as seen by Becks and the Trimble group. Nevertheless, the Northwestern group placed much emphasis on salivary flow in providing neutralizing substances at the points needed, and Becks and Wainwright[162, 163] have shown that, although the calcium and phosphorus concentration is higher per unit of slow-flowing saliva, the total amount is greater in fast-flowing saliva.

Effect of pH on Caries

The effect of pH is another of those controversial issues of dental caries. At the time of preparation of this article the Columbia group[138,164] had not obtained any definite results on pH correlation with caries-free and caries-susceptible groups as far as saliva is concerned. Their tests were made on stimulated saliva, however, and it is well to remember that the buffering capacity of stimulated saliva is greater than that of resting saliva.

In 1938 Stephan[165] made use of the colorimetric analysis methods, after Karshan had pointed out that titratable alkalinity was a better measure of caries susceptibility than was pH. Stephan called attention to the fact that acid production utilized buffering capacity and thus did not change the pH greatly, as

156. Fosdick, L. S., The Result of the Research in the Chemistry of Dental Caries, in *The Cause and Prevention of Dental Caries*. Chicago: Good Teeth Council for Children, 1938, p. 40.

157. Shafer, Z. M., The Phosphatase Activity of the Oral Tissues. *Northwestern Univ. D. Res. & Grad. Quar. Bul.* (August) 1937, p. 26.

158. Gies, W. J., Tissue Enzymes and Caries. *Am. J. Physiol.* 23:361 (October) 1929.

159. Becks, Hermann, in *The Cause and Prevention of Dental Caries*. Chicago: Good Teeth Council for Children, 1938, p. 61.

160. Trimble, H. C.; Etherington, J. W., and Losch, P. K., Rate of Secretion of Saliva and Incidence of Dental Caries. *J. D. Res.* 17:299 (August) 1938.

161. Karshan, Maxwell, Do Calcium and Phosphorus Differ Significantly in Caries-Free and Active-Caries Groups? *J. D. Res.* 21:83 (February) 1942.

162. Becks, Hermann, and Wainwright, W. W., Human Saliva. XII. Effect of Flavored Activators on Salivary Flow and Calcium and Phosphorus Composition. *J. D. Res.* 21:87 (February) 1942.

163. Becks, Hermann; Wainwright, W. W., and Young, D. H., Does Salivary Calcium and Phosphorus Composition Differ Significantly in Caries-Free and Caries-Active Individuals? *J. D. Res.* 20:171 (June) 1941.

164. Hubbell, Rebecca B., Chemical Composition of Saliva and Blood Serum of Children in Relation to Dental Caries. *Am. J. Physiol.* 105:436 (August) 1933.

165. Stephan, R. M., Hydrogen Ion Concentration of the Dental Plaque. *J. D. Res.* 17:251 (February) 1938.

far as specimens of stimulated saliva were concerned. Since caries dissolution occurs primarily in comparatively isolated regions of the mouth, the colorimetric method could be regarded as a better measure. Stephan found that pH of dental plaques varied from 4.0 to 7.6, with the usual range from 5.0 to 7.0. Rinsing the mouth with a carbohydrate solution caused a fall in pH to as low as 4.0, an almost immediate drop lasting for thirty minutes to several hours.[166]

Swerdlove,[167] using the colorimetric methods of Stephan on 351 young men, found no extreme values of salivary pH as did Stephan and concluded that there was no relation between pH of normal resting saliva and incidence of dental caries. Campaigne,[168] using the antimony electrode, corroborated the work of Stephan. Campaigne thought that the pH of sugar-saliva-enamel mixtures could not be used accurately as an index because the finely divided enamel tended to buffer the solution, a phenomenon that would not be met with in pH determinations in the mouth. Since human enamel is supposed to be a hydrated tricalcium phosphate, which is not stable below pH 5.0, it is not surprising that Enright, Friesell and Trescher[103] found that enamel started to etch in buffered solutions of pH 5.2 and lower.

Campaigne noted that ingestion of carbohydrate caused a rise in pH, followed by an immediate drop in the first half hour, with a return to normal dependent on caries susceptibility. He concluded that the rapid drop might explain the rapid decalcification of enamel that apparently occurs in the mouth for short periods of time. Together with Fosdick,[169] he observed, using the antimony electrode, that the pH averaged 6.4 in noncarious areas and 5.9 in carious regions of the mouth. This finding compared favorably with the results of Stephan,[165] who, after testing 211 plaques, found an average pH of 5.9 but a distribution of from pH 5.0 to pH 6.8.

Carbohydrate Degradation

The work on carbohydrate degradation in its action under various enzyme systems of bacterial, muscle or plant origin has been done by Harden,[170] Meyerhof,[171] Wood, Stone and Werkman[172] and others, who found that a chain of reactions was necessary for production of acids from carbohydrates. In 1933 Fosdick[173] started a long study on the solvent power of saliva in the presence of carbohydrates. It was found that any saliva, if allowed to stagnate in the presence of sugar, will decalcify the teeth. These investigators noted the great difference in the rate at which the two types of saliva acted on the enamel of the teeth in the presence of free sugars.

In 1936 Fosdick and Hansen[117] first applied the Meyerhof scheme for carbohydrate degradation to the dental caries problem. Many intermediate compounds in the scheme were isolated by Fosdick[174] in the Meyerhof chain, mixtures of saliva, glucose and tooth enamel being used. Hansen and Fosdick[117,175] pointed out

166. Stephan, R. M., Changes in Hydrogen-Ion Concentration on Tooth Surfaces and in Carious Lesions. *J.A.D.A.* 27:718 (May) 1940.

167. Swerdlove, C. K., Relation Between the Incidence of Dental Caries and the pH of Normal Resting Saliva. *J. D. Res.* 21:73 (February) 1942.

168. Campaigne, E. E., Some Chemical Aspects of Dental Caries (Master's Thesis, Northwestern University). Chicago: 1938.

169. Fosdick, L. S., and Campaigne, E. E., Production and Characteristics of Synthetic Mucin Plaques. *Northwest. Univ. D. Res. & Grad. Quar. Bul.* (May 2) 1938, p. 14.

170. Harden, A., Fermentation by Dried Yeast Preparations. *Biochem. J.* 19:477 (April) 1925.

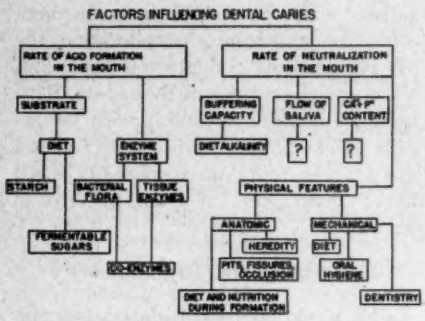
171. Meyerhof, O., Carbohydrate Metabolism. *Biochem. Zeitng.* 292:25 (May) . .

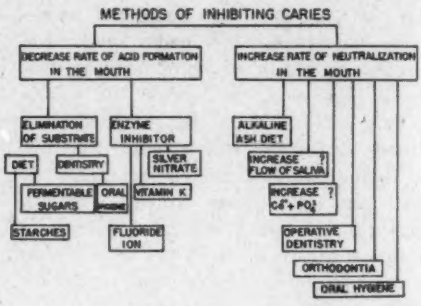
172. Wood, H. G.; Stone, R. W., and Werkman, C. H., Intermediate Metabolis . . . Bacteria. *Biochem. J.* 31:349 (March) 1937.

173. Fosdick, L. S., The Action of Sugar Solutions of Saliva on Human Enamel. *Northwest. Univ. D. Res. & Grad. Quar. Bul.* 47:8 (August 2) 1937.

174. Fosdick, L. S., Carbohydrate Degradation by Mouth Organisms. *J.A.D.A.* 26:415 (March) 1939.

175. Fosdick, L. S., and Hansen, H. L., Carbohydrate Degradation by Mouth Organisms. *J. D. Res.* 17:502 (August) 1938.





the similarity of degradation of muscle tissue carbohydrate and fermentation of carbohydrates by yeast and other aciduric organisms. As was expected, lactic acid was found to be the predominant acid formed in the chain of reactions taking place in the mouth.[145] This finding confirmed results of Miller and Muntz,[176] who had found lactic acid in appreciable quantities in carious lesions. Besides lactic acid, the other decalcifying acids are phosphoglyceric acid, pyruvic acid, acetic acid, butyric acid and probably succinic acid.

Complexity of Problem

Continued research by Fosdick and the Northwestern group[177] on the biochemical properties of saliva has confirmed the complex picture painted by so many other investigators. The character of saliva is never constant. The pH at which enamel dissolves is variable, depending on the calcium and phosphorus already in solution. It was found that pH 6.6 was the highest at which enamel would dissolve; pH 5.9 was the lowest at which enamel could exist without decalcifying. Mixed saliva was found at no time to be of sufficiently low pH to dissolve enamel because of the great number of factors in the buffering mechanism designed to neutralize acids as they are formed.

The Northwestern group recognizes the positive correlation between caries susceptibility and presence of the L. acidophilus but maintains that, although this serves as an excellent diagnostic test, approximately 85 per cent efficient, decalcification is probably due to symbiosis of the enzyme systems of a mixed flora. A chemical test was evolved based on the rate of acid formation in mixtures of glucose, saliva and powdered enamel. The saliva specimen is incubated for four hours with the enamel and sugar, the amount of calcium dissolved being the index of the degree of acid formation.[174, 178]

The complex variables have been classified into two broad groups by Fosdick.[179] One consists of harmful or destructive entities, primarily acid formation, and the rate is subject to enzyme formation, diet, bacterial flora, occlusion and factors influencing distribution of the products of the enzyme system. The second group incorporates those factors which neutralize the destructive influences, granted a variable amount of immunity, such as the amount of calcium

176. Miller, B. F., and Muntz, J. A., A Method for the Estimation of Ultramicroquantities of Lactic Acid. *J. Biol. Chem.* 126:413 (November) 1938.

177. Fosdick, L. S., and Starke, A. C., Jr., Solubility of Tooth Enamel in Saliva at Various pH Levels. *J. D. Res.* 18:417 (October) 1939.

178. Burrill, D. Y., and Fosdick, L. S., The Buffering Capacity and Rate of Flow of Saliva in Relation to Dental Caries. *Northwest. Univ. Bul.* 44:6 (March 6) 1944.

179. Fosdick, L. S., A Correlation of Some Facts Concerning the Etiology and Control of Dental Caries. *J. Canadian D. A.* 9:339 (August) 1943.

and phosphorus ions in saliva, flow of saliva, occlusion, tooth form and enzyme inhibitors. The accompanying charts, suggested by Fosdick,[179] show the correlation and interdependence of associated factors and the available methods of caries control.

Comment

This summary of the work done on local factors in the causation and control of dental caries presents the complex picture that investigators have given us. Perhaps the most coherent and logical approach to the problem is that of the Northwestern group, which shies away from the attempt of so many to attribute dental caries to a single causative agent. Recognition of the balance and interplay of numerous environmental entities provides us with a workable basis for control and further research.—*311 East Chicago Avenue.*

THE FEDERAL FOOD, DRUG AND COSMETIC ACT AS IT RELATES TO DENTAL PRODUCTS

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The Federal Food, Drug and Cosmetic Act complements the practice of dentistry in its fundamental purpose to protect the public health. The dental practitioner benefits in that he is able to prescribe and use drugs, devices and cosmetics with pertinent information regarding such products and with confidence in their reliability. Of particular importance is the protection provided by the Federal Food, Drug and Cosmetic Act against the marketing of new drugs which have not been tested critically for safety.

The Federal Food, Drug and Cosmetic Act, enacted in June 1938, provides for truthful labeling and purity of foods, drugs, devices and cosmetics. The enforcement of this Act is carried out by the Food and Drug Administration, which agency Congress established on July 1, 1927 to administer the Food and Drugs Act of 1906. Also it is the function of this organization to enforce four additional statutes; namely, the Tea Act, the Import Milk Act, the Filled Milk Act and the Caustic Poison Act. In 1940 under the Reorganization Plan IV this Administration was transferred to the Federal Security Agency from the United States Department of Agriculture. The Federal Security Agency, dealing with many aspects of public welfare, with health and medical care an important part, includes the United States Public Health Service, Saint Elizabeths Hospital and Freedmen's Hospital; the Office of Education, and under its direction, Howard University; the Social Security Administration, which has acquired recently the Children's Bureau, formerly in the Department of Labor; and the Food and Drug Administration and the Office of Vocational Rehabilitation which are both assigned to the Office of Special Services.

Division and Personnel

The Food and Drug Administration is headed by the Commissioner of Food

and Drugs who, through his staff of administrative officers, directs and coordinates regulatory activities, including inspections and investigations conducted by the field stations throughout the United States. Geographically the field service is composed of three inspection districts: the Atlantic seaboard roughly comprises the Eastern District, with headquarters at New York; the Mississippi Valley, the Central District, with headquarters at Chicago; and the Rocky Mountain and Pacific slope areas, the Western District, with headquarters at San Francisco. Each district is under the direction of a district chief, and his territory in turn is subdivided into stations with headquarters in sixteen strategic cities. Each station has a corps of inspectors, chemists and other technologists and clerical personnel. The stations are the operating headquarters from which the details of inspection work are directed and in which the bulk of the laboratory examinations are made. In addition there are three substations equipped with laboratory and inspection facilities and thirty-three nonlaboratory inspection posts. These field units are located strategically to effect the most complete coverage practicable of the origin and flow of interstate traffic in the regulated commodities.

The Food and Drug Administration is a relatively small federal organization. Its personnel numbers slightly more than a thousand and more than 650 of these, including the inspection personnel of 234, are trained in various phases of scientific work. The remainder are in administrative, clerical, custodial and other nonprofessional classifications. The annual appropriation is about four and a quarter million dollars.

In addition to the administrative personnel, most of whom are professional, the Washington headquarters of the Food and Drug Administration include a number of technical divisions. The Food Division concerns itself with foods exclusively. It has extensive chemical laboratories and engages in considerable research to acquire technical data of value as a basis for administrative action and to develop new analytical methods for the detection of adulterations. The Cosmetic Division was set up under the Federal Food, Drug and Cosmetic Act of 1938 to handle problems dealing with the safety and labeling of cosmetics, which that Act for the first time placed under federal control. This division consists of two sections, one for cosmetic analyses and the other for coal tar dye certification. The Act specifically provides that no coal tar dye may be added to a food, drug or cosmetic unless it is from a batch certified by the Food and Drug Administration for such use.

Another specialized technical group is the Division of Pharmacology which tests drugs requiring bio-assays, certifies insulin and conducts pharmacologic investigations on acute and chronic toxicity of selected drugs and cosmetics and of new substances added to food. It is doing considerable work in the field of hormones. The Vitamin Division is involved primarily in devising and conducting analyses of vitamins by chemical, biochemical and biological methods, particularly with regard to potency and unwarranted claims. The Microbiological Division is concerned with bacteriologic and microscopic examination of foods, drugs and cosmetics for contamination with toxic organisms or filth, for decomposition or for other forms of adulteration.

The most recently established division is the Division of Penicillin Control and Immunology. In 1945 the Federal Food, Drug and Cosmetic Act was amended to include the certification of all penicillin and its products prior to distribution in interstate commerce. The penicillin used by the dental profession is certified by this Administration, after experimental tests prior to distribution to assure its potency, purity and freedom from toxicity. The Act has been amended further

to require the same type of certification of streptomycin.

The Medical Division is concerned with the medical phases of enforcement problems throughout the entire field of food, drugs, devices and cosmetics. It is concerned more directly with the enforcements dealing with dental problems, whether drug, device or cosmetic, than are the other technical divisions. This scientific group reviews labels to detect false and misleading representations on the various classes of products distributed to the dental profession. In addition, the adequacy of directions for use and the warnings against misuse on drugs distributed directly to the laity are carefully considered, as well as the dangers associated with the use of the product as directed. New drugs, as defined in the Act,[1] are carefully reviewed in the New Drug Section of the Medical Division. Specifically, if new drugs intended for dental use are encountered or new dental uses for old drugs are contemplated, it is the duty of this section to evaluate carefully the safety of such products before permitting distribution in interstate commerce. In considering these drugs, consultation with experts in the dental field is essential.

Enforcement Procedures

The Federal Food, Drug and Cosmetic Act provides three kinds of court procedure against violations. When violative goods are shipped in interstate commerce, (1) they may be seized, (2) the shipper may be prosecuted criminally or (3) he may be enjoined from further violations, or any two or all of such actions may be taken. In each instance the action is brought in the federal courts. In the case of seizure the owner of the seized goods may allow them to go by default which results in either destruction or diversion to legal uses under court order; or he may elect to admit the violation and ask the court to permit the withdrawal of the goods under bond for relabeling or other action that will bring them into compliance; or he may deny that the goods are in violation and elect to go to trial. In the case of criminal prosecution or injunction proceedings, unless the defendant admits guilt, the case is scheduled for trial.

In the presentation of court cases involving medical questions, the government requires the assistance of experts in the particular field of therapy concerned, and accordingly in court actions dealing with dental products the testimony of dental experts is required to present the medical and dental facts of the case and to explain to the court and jury the basis for the charges from the dental standpoint. It cannot be stressed too forcefully that it is only with full cooperation of the informed persons in this field that the Food and Drug Administration is able to bring about effective corrections in the labelings of dental products in the interest of the public.

The salient requirements of the Federal Food, Drug and Cosmetic Act with respect to drugs and devices can be set forth as follows:

1. The article must conform with the strength, purity or quality which it purports or is represented to possess.

2. The labeling (this includes all printed and graphic matter which accompanies the article in interstate commerce) must be truthful. Extravagant therapeutic representations made for an article constitute a major problem under this

1. The term "new drug" means any drug the composition of which is such that such drug is not recognized generally among experts, qualified by scientific training and experience to evaluate the safety of drugs, as safe for use under the conditions prescribed, recommended, or suggested in the labeling thereof, except that such a drug not so recognized shall not be deemed to be a "new drug" if at any time prior to the enactment of this Act it was subject to the Food and Drugs Act of June 30, 1906, as amended, and if at such time its labeling contained the same representations concerning the conditions of its use; or any drug the composition of which is such that such drug, as a result of investigations to determine its safety for use under such conditions, has become so recognized, but which has not, otherwise than in such investigations, been used to a material extent or for a material time under such conditions.

section of the Federal Food, Drug and Cosmetic Act.

3. The label must bear the name and address of the manufacturer, packer or distributor, as well as a statement of the quantity of contents.

4. The labeling must bear adequate directions for use. In the case of articles sold for lay use proper indications for administration must appear and adequate directions for such indications must be supplied. Articles which can be used safely or efficaciously only under the supervision of dentists, physicians or veterinarians must bear the statement: "Caution: To be dispensed only by or on the prescription of a dentist (physician or veterinarian)" in lieu of directions for use, provided the other requirements of the regulations under this section of the Act are met. For products distributed under this special exemption, the manufacturer generally supplies directly to the dentist, upon request, an informative brochure apart from the market package which sets forth detailed scientific and technical information relating to the use of the drug or device. In the case of new drugs such descriptive circulars are required to be submitted for critical review before distribution, inasmuch as the practitioner may not be sufficiently well acquainted with a new drug to use it both safely and efficaciously if he does not have carefully prepared information available.

Also it is clear that the members of the dental profession on the editorial boards of journals can contribute effectively toward assisting the Administration by carefully selecting, evaluating and criticizing the data which investigators transmit for publication in order to limit the extravagant claims for a new product. Such claims often lead to undue publicity and the resultant opportunity for misrepresentation of a product by an unscrupulous manufacturer. A special class is made of drugs packaged in ampules or cartridges to be administered by injection under dental or medical supervision. In this instance adequate directions should accompany the product.

5. The labeling must bear adequate warnings against use in those pathologic conditions or by children where its use may be dangerous to health or against unsafe dosage or methods or duration of administration or application in such manner and form as are necessary for the protection of users.

6. The article must not be dangerous to health when used in the dosage or with the frequency or duration prescribed, recommended or suggested in the labeling thereof.

7. In the case of certain drugs intended for use by man, if they contain any of a list of narcotic or hypnotic substances which have been found to be habit forming, or any derivative of such substance, the label must bear the statement "Warning—May be habit forming" in juxtaposition to the quantitative declaration of the drug. Such drugs include, among others: barbiturates, chloral, cocaine, codeine, morphine, opium and paraldehyde.

8. The label of a drug must bear the common or usual name of each active ingredient including the quantity, kind and proportion of any alcohol, and also including, whether active or not, the name and quantity or proportion of any bromides, ether, chloroform, acetanilid, acetphenetidin, amidopyrine, antipyrine, atropine, hyoscyamine, arsenic, digitalis, digitalis glucosides, mercury, ouabain, strophanthin, strychnine, thyroid or any derivative or preparation of any such substances contained therein. Drugs sold for prescription use only must bear a quantitative declaration of each active ingredient so that the professional user can evaluate the product with full information as to its composition.

9. Special provision has been made for investigators to obtain new drugs intended solely for investigational use by experts qualified by scientific training

and experience to investigate the safety of drugs. The expert, before receiving the drug for such investigation to be conducted by him, must provide the manufacturer with evidence that he has adequate facilities for the investigation to be conducted by him and must promise that such drug will be used solely by him or under his direction for the investigation. As a consequence, the expert has certain responsibilities under the terms of the Act beyond the critical scientific and clinical trial which is to be conducted.

A cosmetic by definition is any article intended to be rubbed, poured, sprinkled or sprayed on, introduced into, or otherwise applied to the human body or any part thereof for cleansing, beautifying, promoting attractiveness or altering the appearance, except that this term shall not include soap. The dental products which fall into this class are dentifrices and mouthwashes primarily. If no therapeutic representations are made for such articles the label need bear only the name and address of the manufacturer, packer or distributor and an accurate statement of the quantity of contents. No statement of ingredients or directions for use or warnings against misuse are required. If therapeutic claims are made for such an article, it is classed as a drug, as well as a cosmetic, and the full requirements of the Act relating to drugs must be met. If the cosmetic contains any poisonous or deleterious substance which renders it injurious to the user under the conditions of use prescribed in the labeling, it is actionable as an adulterated cosmetic. If the article contains a coal tar dye from a noncertified batch (except for hair dyes) likewise it will be subject to action as an adulterated cosmetic.

It cannot be emphasized too strongly that the protection provided by the Act from adulterated and misbranded drugs, devices, cosmetics and foods is an extensive, far-reaching and continuing task. The American Dental Association can continue to make a valuable contribution in the interest of this Act to protect the public health and welfare by assuming the leadership in working out the numerous scientific and technical problems which are always present in the field of dental therapeutics.—*Food and Drug Administration.*

Utilizing Human Talent.—Within the practical limitations inherent in any undertaking of such tremendous scope, American man power was selected and trained in the armed forces solely in the interests of the national welfare. Whether a man received a certain course of training or a particular duty assignment depended on his abilities and the needs of the services, though in many cases his preferences were taken into account if it was practicable to do so. In peacetime, the requirements for training citizens in the interests of the national welfare are, by comparison, ill-defined. Freedom of the individual to choose his own activities and to map out a career for himself rather than the compulsion demanded by the exigencies of national defense becomes a paramount consideration. Nevertheless, the selection and classification of men and women in the armed forces primarily on the basis of their merit and of the national welfare suggests that in a society becoming more democratic all the time, some systematic, nation-wide procedure be developed for identifying men and women of exceptional and specialized talent and for providing them with the opportunity of appropriate training regardless of their financial resources or those of the community in which they happen to reside.—*Frederick B. Davis, Utilizing Human Talent. Washington, D. C.: American Council on Education, 1947, pp. 34-35.*

THE Journal OF THE
AMERICAN DENTAL ASSOCIATION

JULY 15, 1947 • VOLUME 35 • NUMBER 2

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Published by the American Dental Association • 222 East Superior St. • Chicago 11, Ill.

EDITORIALS

ARMY DENTAL BILL INTRODUCED INTO CONGRESS

A BILL (H.R. 3336) to improve dental service in the Army was introduced into the House of Representatives on May 6 by Walter E. Brehm of Ohio. The complete text of the bill, which is sponsored by the Committee on Legislation of the American Dental Association, is printed on page 128 of this issue of THE JOURNAL. In April the Army issued its latest revised regulations governing the activities of the Dental Corps. These revised regulations are published on page 131.

The Medical Department of the Army, under fire from the dental profession, is attempting to bring about the necessary improvements through revision of its regulations. The Committee on Legislation is convinced that permanent improvement will be secured only through legislation. Facts, well known to every dentist who has served in the armed forces, substantiate the Committee's conclusions.

As has been reported repeatedly in THE JOURNAL, Army dental officers during the war were compelled to serve under regulations that represented nothing less than the gross maladministration of a vital health service. The American Dental Association used every means at its disposal to have these conditions corrected. It even considered the introduction of legislation. However, not wishing to interfere with the war effort, the Association abandoned its legislative proposals and sought to secure improvements through revision of Army regulations. After months of strenuous effort on the part of the American Dental Association, the Army, in August 1945, revised that part of its regulations which governs the Dental Corps. As in all cases of compromise, the revisions by no means corrected all of the imperfections in administration under which dental officers were forced to function. Revision did, however, bring about some temporary improvements which permitted the Corps to render better service. These improvements lasted only one year. In August 1946 the regulations were revised again, and the status of the Army Dental Corps reverted

to that which it occupied prior to 1945. The 1946 revision immediately precipitated a volume of protest from the dental profession, and in April 1947 the regulations were again revised. These latest revisions are essentially the same as those adopted in August 1945. How long they will remain in effect is a matter of conjecture.

Although this latest action by the Medical Department of the Army may be helpful, it does not provide a satisfactory solution to the Army's dental problem. Three revisions in regulations in less than three years constitute prima facie evidence that permanent improvement in the administration of the Army Dental Corps cannot be effected through regulation. Members of the Dental Corps have no assurance that the regulations will not be revised again next year, or the year after or at any time the Surgeon General and his staff may elect. So long as regulations can be changed at the inclination of those in authority, just so long will the status of the Army Dental Corps be insecure, the morale of its officers low and the service inadequate.

No department within an organization can function effectively unless it is established on a firm foundation. No department can function effectively unless its officers have authority commensurate with responsibility. No department can function effectively unless its members are accorded the same respect as that accorded members of equal rank in other comparable departments. Under existing conditions the Army Dental Corps is not accorded these privileges.

Now that the United States is again on a peacetime basis and there is no longer any possibility that the American Dental Association will disturb the war effort by recommending reorganization of one branch of the Army health service, this long overdue Army Dental Bill (H.R. 3336) should be enacted. This bill would place the Army Dental Corps on a firm foundation, comparable with that of the Army Medical Corps, and would enable the Dental Corps to establish its own professional standards and policies. It would permit the Corps' administrative officers to initiate and direct all actions relating to dental service in the Army. It would give the Dental Corps full responsibility for securing facilities, equipment and supplies necessary to render adequate service and for appointing, training and directing its own personnel. Under the provisions of the bill, all matters relating to the dental service as a whole are to be administered by the chief of the Dental Corps. The dental surgeon of every Army headquarters and installation that have dental facilities is to be regarded as a member of the technical staff and is to be responsible directly to the commanding officer for the administration of all matters relating to the dental service. The bill also provides equality of rank, pay and allowance with officers of corresponding grades in the Medical Corps.

Once H.R. 3336 is enacted, the Dental Corps can develop a service of which it can be proud without fear of interference by those who are untrained in dental science and who are at times indifferent to dentistry's problems. Once the bill becomes law, its provisions cannot be revised easily at the whim of a coterie of high ranking officers.

The mere introduction of a bill does not assure its passage. Congressman Walter E. Brehm of Ohio and the Committee on Legislation will need the active support of the entire dental profession in order to transform H.R. 3336 into law.

Every state and component dental society should acquaint their representatives in Congress with the conditions under which the members of the Army Dental Corps now function, with the impossibility of rendering adequate service under those conditions and with the necessity of enacting legislation that will ensure better dental service to Army personnel in the future.

A. D. A. AFFAIRS

MEETING MARKS ANNIVERSARY OF A.D.A. REORGANIZATION

The eighty-eighth annual meeting of the American Dental Association will mark the twenty-fifth anniversary of the incorporation of the Association in its present form.

In June 1922 the American Dental Association was reorganized and incorporated in the state of Illinois, with thirteen trustees. Of those thirteen trustees, five are still living.

R. H. Volland, treasurer of the American Dental Association, is one of the original trustees who are still living. The others are Thomas B. Hartzell, Minneapolis; Otto U. King, Huntington, Ind.; John D. Millikin, San Francisco, and Carl D. Lucas, Los Angeles.

The seven additional trustees were John P. Buckley, Los Angeles; C. C. Allen, Kansas City, Mo.; Thomas P. Hinman, Atlanta, Ga.; Harvey J. Burkhart, Rochester, N. Y.; C. W. Hall, Milwaukee; Waldo E. Boardman, Boston; Clarence J. Grieves, Baltimore, and Arthur R. Melandy, Knoxville, Tenn.

Dr. Volland has prepared a statement on the purposes and accomplishments of the American Dental Association in the past twenty-five years. A summary of the statement follows.

During the last twenty-five years, the American Dental Association has exhibited a constant and rather phenomenal evolution. At no time has there been a serious threat to the original objectives of the Association and no disturbing innovations have been instituted.

A total of 27,126 dentists constituted the membership in 1922 when the name was changed from the National Dental Association to the American Dental Association. During this last quarter of a century the membership has increased more than 38,000, to the highest percentage of eligible members of any similar voluntary professional organization.

The total assets in 1922 were $217,245. It was recently anticipated that the total resources of the Association would exceed $2,000,000 on June 30, 1947. The present central office building and its equipment, costing $224,000, are included in this figure.

In 1922 the membership fee was $2. The income from that source was $54,000 in round figures. The present dues are $6. They provided an income approaching $400,000 in 1946-1947.

The budget adopted in 1922 for the ensuing year carried an anticipated income from all sources for general purposes of $143,000 and an estimated expense of $121,161. The budget for 1946-1947 for general purposes was based on an anticipated income of $685,000 and authorized expenditures of $960,000.

In 1922 the budget listed eight sources of income for general purposes and eleven activities received appropriations. The budget for 1946-1947 listed seventeen sources of income, and forty-three activities received appropriations.

Of the eleven activities listed in 1922, nine, The Journal, the Secretary-Editor, the Annual Session, the President, the Treasurer, Mouth Hygiene and Public Instruction, the Judicial Council, Dental Legislation and the Dental Educational Council of America, or their counterparts, are found in the 1946-1947 budget. During the ensuing twenty-five years such major activities have been added as the Bureau of Public Relations, the Library Bureau, the Council on Dental Therapeutics and Bureau of Chemistry, the fellowship in the National Bureau of Standards and in the National Institute of Health under the Research Commission, the National Board of Dental Examiners, the Dental Index, the Council on Dental Health, the Committee on Economics, the Committee on International Relations, the Journal of Oral Surgery, the Committee on Dental Museum and the Dental Directory.

In 1924 the Relief Commission was organized, and in February 1925 the first check for benevolent purposes was drawn on the Relief Fund. In 1928 a business manager was added to the staff. In 1942 a full time general secretaryship of the Association was established.

During the last twenty-five years not only the seasoned activities but also the relatively newer ones have been intensified in an orderly development. The original concept of service to the profession and the public has been maintained as the ruling motive.

LATIN AMERICAN DELEGATES NAMED TO A.D.A. BOSTON MEET

An official delegation to represent the *Asociacion Odontologica, Argentine* at the Tenth International Dental Congress, to be held in conjunction with the eighty-eighth annual meeting of the American Dental Association in Boston, has been appointed by the Board of Directors, under the direction of Humberto Aprile, president of the Argentine association.

The members of the delegation are Maria Ines de Egozcue, Margarita Muruzabal and Juan Ubaldo Carrea, officials of the association.

WORLD WAR II DENTAL OFFICERS TO ATTEND LUNCHEON AT BOSTON

The Massachusetts Dental Officers of World War II will be host to members of the profession who served in the armed forces at a luncheon August 5, at 12:15 p.m. at the University Club, Boston, in connection with the annual meeting of the American Dental Association.

Luncheon tickets may be obtained from A. M. Flaschner, 419 Boylston St., Boston 16.

TUFTS CLASS OF 1922 WILL HOLD REUNION AT BOSTON

The class of 1922 of Tufts College Dental School will hold its twenty-fifth reunion August 5 at the Hotel Somerset, Boston, during the week of the annual meeting of the American Dental Association.

For reservations, write Dr. Nathan Becker, 100 Boylan St., Boston 16.

XI PSI PHI ANNOUNCES PLANS FOR TOUR AUGUST 3 IN BOSTON

Xi Psi Phi dental fraternity plans a historical sightseeing tour for members and their wives at the Boston meeting, on August 3, Harold W. Oppice, secretary, has announced. The tour will start from the Puritan Hotel, and will cover Boston, Cambridge and the Back Bay area.

It is requested that reservations be made early. Tickets may be obtained by writing to Dr. Edward L. Soaris, 84 Spring St., New Bedford, Mass., or by writing to the central office of the fraternity, 1002 West Wilson Ave., Chicago 40.

The members of the fraternity are invited to visit the Xi Psi Phi headquarters in the Puritan Hotel during the annual meeting of the American Dental Association.

A.D.A. GOLF TOURNAMENT PLANS FOR BOSTON MEETING ANNOUNCED

The Prize Dinner of the American Dental Association Golf Tournament will be held at the Harvard Club, August 5, during the Boston meeting.

The Calcutta Pool and dinner will be held at the Hotel Kenmore, August 3. Complete information in regard to the tournament, including directions to all golf clubs, will be available in a folder issued by the American Dental Association.

LOYOLA DENTAL ALUMNI TO HOLD BREAKFAST MEETING AUGUST 5

The Alumni Association of the Chicago College of Dental Surgery, Loyola University, will hold a breakfast meeting at the Copley-Plaza Hotel, Boston, at 8 a.m. Tuesday, August 5.

E. A. Archer, 58 East Washington Blvd., Chicago 1, is in charge of reservations.

ASSOCIATION OF DENTAL EDITORS TO MEET AUGUST 2

The American Association of Dental Editors will meet August 2, at the Hotel Statler in Boston, in conjunction with the eighty-eighth annual meeting of the American Dental Association.

Speakers at the conference will be Mr. Harland Ratcliff, editorial writer for the Boston *Herald-Traveler* and head of the Department of Journalism at Suffolk University, and Mr. Ray Kierman, newscaster and formerly city editor of the Boston *Traveler*, who will talk on the subject, "An Editor's Responsibility."

CATHOLIC DENTAL GUILD TO HOLD MEETING AUGUST 3

The Guild of St. Appollonia of Boston will hold a banquet and entertainment August 3, in the main ballroom of the Hotel Puritan, in connection with the activities of the annual meeting of the American Dental Association. Msgr. Richard J. Cushing, Archbishop of Boston, will be the principal speaker.

Dentists from the various states who are connected with the Guild and wish to attend this meeting should write for reservations to Dr. William H. Canavan, 47 Bay State Road, Boston.

DENTAL HEALTH SOCIETIES TO MEET JOINTLY AT BOSTON

The American Society of Dentistry for Children and the American Association of Public Health Dentists will hold a combined meeting August 2-4 at the Somerset Hotel, Boston, in connection with the annual meeting of the American Dental Association.

Speakers on the program will include Joseph Volker, newly appointed dean, Tufts College Dental School, and Paul K. Losch, professor of children's dentistry, Harvard School of Dental Medicine.

Each society will provide a portion of the total program, which will deal with recent advances in children's dentistry and in the dental public health program, including an analysis of the fluorine question.

The American Society of Dentistry for Children will sponsor a luncheon August 4 in commemoration of its twentieth anniversary. Tickets for the luncheon may be obtained by writing A. L. Corbman, director of the division of dental health, Massachusetts Department of Public Health, at 8 Beacon St., Room 67, Boston 8.

EXTENSIVE WOMEN'S PROGRAM PLANNED FOR BOSTON MEETING

The activities planned for women at the Boston meeting have been announced by Mrs. Philip E. Adams, chairman of the ladies' entertainment committee of the American Dental Association. Information booths for women will be open at all times at the Hotel Statler and the Copley Plaza Hotel or at the Mechanics' Building.

The program for women will include an open house August 4 at the Women's City Club, 40 Beacon St., and an all-day boat trip to Plymouth August 5.

The president's dinner and frolic August 6 at the Hotel Statler will be preceded by a north shore scenic bus trip. A "Minute Man" bus trip through Cambridge, Lexington and Concord will be held August 7.

It is requested that all ticket reservations be made early.

DENTAL SOCIETIES

KANSAS STATE COUNCIL ADOPTS CHILD DENTAL WELFARE PROGRAM

The Council on Dental Health of the Kansas State Dental Association has approved and accepted four recommenda-

tions on the improvement of children's dental hygiene.

The recommendations are as follows:

1. The allotment of operating time for the care of children, in proportion to the 25 per cent ratio of children to adults.

2. The utilization of the facilities made available by the Division of Dental Hygiene, Kansas State Board of Health, for supplying dentists with sodium fluoride for topical application on children's teeth.

3. The further organization of local or county society committees or councils on dental health, and the fostering of community school dental health programs in conjunction with health and school authorities and other interested groups.

4. The promotion and organization of a workshop on dental health by the Kansas State Dental Association.

SUCCESSFUL CANDIDATES LISTED BY STATE BOARD

The Washington State Board of Dental Examiners has announced the names of sixty-seven candidates who have successfully passed the April-May examinations offered by the board. The names of the candidates follow.

Carl P. Ackerman, Yakima; John S. Ainslie, Spokane; James W. Anderson, Seattle; Eldred L. Arch, Loup City, Neb.; Fred P. Barnhart, Bellevue; Walter C. Bayne, Spokane; Robert A. Borish, Seattle; Harvard H. Bresee, Vancouver; Paul E. Chilton, Lynden; Murray W. Christian, Seattle; Clarence I. Coleman, Seattle; Carlyle P. Cornell, Jr., Coulee Dam; Charles J. Cowan, Tacoma; Robert H. Dawson, Longview; Floyd W. Dodds, Burien, and Francis J. Donahue, Longview.

George D. Dore, Coleraine, Minn.; Raymond J. Edlin, Seattle; Donald G. Eland, Portland, Ore.; J. W. Falkeureck, Spokane; Harry G. Farrell, Butte, Mont.; R. G. Fordyce, Audubon, Iowa; Arthur H. Forsyth, Jr., Pe Ell; James A. Garson, San Francisco; Samuel G. Gimpel, Seattle, and R. A. Gross, Sumner.

Walter B. Heikel, Hoquiam; William R. Herian, Seattle; Robert H. Huntington, Portland, Ore.; Thomas W. James, Tacoma; Richard J. Johnson, Seattle; Manfred I. Kelland, Seattle; S. Frank Kanemori, Seattle; James J. Kepl, Spokane; Harry J. Kraft, Seattle; T. E. Lavin, Geiger Field; Arthur G. Linrud, Poulsbo, and Raymond C. Magnuson, Wapato.

Calvin J. McCrum, Longview; Charles McHugh, Sedro Woolley; Ernest F. Miller, Seattle; Carrol S. Milne, Yakima; John K. Nesvig, Yakima; John O. Neufeld, Portland, Ore.; Clarence O. Nurmi, Alameda, Calif.; Willard F. Odle, Bellevue; Joseph A. Parosa, Tenino; James E. Payne, Longview; Guy E. Romans, Yakima; Anthony F. Roucek, Richland; William F. Royal, Elma; John S. Rule, Jr., Spokane, and Kenneth E. Rydbom, Vancouver.

George Sale, Jr., Longview; James F. Saylor, Richland; Stanley L. Shephard, Puyallup; A. P. Shirey, Midland, Texas; Walter O. Skreslet, Portland, Ore.; Harry D. Sloan, Jr., Seattle; Bernard T. Thompson, Vanport, Ore.; Richard V. Tucker, Seattle; Donald E. Veatch, Longview; John E. Warrens, Portland, Ore.; Everett C. Watt, Coulee Dam; Robert J. Whisler, Centralia; George E. Wood, Coeur d'Alene, Idaho, and B. H. Zimmerman, Vancouver.

LATEST DENTAL SOCIETY ACTIVITIES AND MEETINGS

Illinois.—The newly elected officers of the Chicago Dental Society are Harry A. Hartley, president; Edwin W. Baumann, vice-president; Arno L. Brett, secretary, and Vincent B. Milas, treasurer.

Louisiana.—The next annual meeting of the Louisiana State Dental Society will be held April 8-10, 1948, in Alexandria, according to Julian S. Bernhard, secretary.

North Dakota.—K. W. Morris, Bismarck, has been appointed to the North Dakota State Health Council by Gov. Fred G. Aandahl, according to an announcement made by the Council.

Texas.—The Texas State Dental Society at its recent annual session passed a resolution that the United States should adopt and put into effect a system of universal military training for a period of

one year for men between the ages of 17 and 21. The resolution also called for the sending of copies of the resolution to the President, the Secretary of War, the senators from Texas and the representatives from Texas, to request their initiation and support of the necessary legislation.

Wisconsin.—The 1948 annual meeting of the Wisconsin State Dental Society will be held March 30-31 and April 1, in Milwaukee, according to Kenneth F. Crane, executive secretary.

LEGISLATION

TWO BILLS TO REORGANIZE ARMY DENTAL CARE ARE INTRODUCED

L. Mendel Rivers, South Carolina, has introduced into the House of Representatives a bill to provide more efficient dental care for the personnel of the United States Army.

The bill, H. R. 3616, is a counterpart of H. R. 3336, which was introduced into the House earlier by Walter E. Brehm, Ohio. The text of H. R. 3336 is published elsewhere in this issue of THE JOURNAL.

The bills call for a reorganization of the Army Medical Department so as to provide for greater autonomy of the dental service.

SENATE COMMITTEE APPROVES COMPROMISE ON S.140 AND S.712

The Senate Committee on Expenditures in the Executive Departments by a 9 to 1 vote recently approved a compromise bill to create a new executive department with Cabinet status to be known as the Department of Health, Education and Security.

The compromise bill would provide for three undersecretaries as provided in the original Taft-Fulbright bill, S.140, but would give the President complete discretion in making appointments as provided in the Aiken bill, S.712.

S.140 would have compelled the President to appoint a physician as undersecretary for health. This provision was strongly objected to by public health officers who contended that there was great danger in having a man representing the medical profession in control of the Surgeon General of the Public Health Service.

This difference of opinion arises out of the fact that the United States Public Health Service is officially supporting the President's program of national compulsory health insurance.

VETERANS

VA REPRESENTATIVE ATTENDS MILITARY CONGRESS IN BASLE

Robert C. Cook, deputy director of the Department of Medicine and Surgery, Veterans Administration, represented the Veterans Administration at the International Congress of Military Medicine and Pharmacy, held recently in Basle, Switzerland.

Dr. Cook accompanied representatives of the War and Navy Departments and the U.S. Public Health Service to the conference.

PUBLIC HEALTH OFFICERS ARE ELIGIBLE FOR G.I. BENEFITS

Commissioned officers of the U.S. Public Health Service who were assigned to and served with the armed forces during World War II and are now back on duty with the Public Health Service are eligible for benefits of the G.I. Bill, the Veterans Administration announced recently.

These benefits include education or training and loan guarantees for home, farm or business purposes.

DENTAL SCHOOLS

STERLING V. MEAD RECEIVES GEORGE WASHINGTON U. AWARD

Sterling V. Mead, president of the American Dental Association, was one of the six graduates of the George Washington University who received the 1947 Alumni Achievement Award of the University's General Alumni Association during the May commencement exercises.

Dr. Mead, who received the D.D.S. degree in 1914, was commended for distinction in the field of dental surgery.

ILLINOIS TO OFFER SEVEN REFRESHER COURSES IN FALL

The College of Dentistry, University of Illinois, will offer seven refresher courses this fall, starting September 8.

Isaac Schour, associate dean in charge of postgraduate studies, announced that courses would be offered in "Complete Dentures," "Partial Dentures," "Oral Pathology, Diagnosis and Surgery," "Root Canal Surgery and Periodontia," "Operative Dentistry," "Dentistry for Children" and "Crown and Bridge."

Dr. Schour said that the courses would be offered in sequence, extending for a total of twelve weeks until November 28. Dentists may enroll in single courses or register for the complete program.

Registration in each course will be limited to six students. Instruction in the courses will be given from 9 a.m. to 5 p.m., Monday through Friday.

ORTHODONTICS SEMINAR IS PRESENTED AT NORTHWESTERN

Thirty-three orthodontists attended the seminar in orthodontics recently presented by the graduate orthodontics department of the Northwestern University Dental School.

The speakers on the program were Allan G. Brodie, professor of orthodontics, University of Illinois; Frederick B. Noyes, former professor of histology, Northwestern University, and Charles R. Baker, former professor of orthodontics, Northwestern University.

MICHIGAN TO OFFER INSERVICE DENTAL TRAINING COURSE IN FALL

The School of Public Health of the University of Michigan will sponsor an inservice training course designed to evaluate available technics in dental caries control. The course will be offered from September 8 to 13.

Control measures will be appraised through research and clinical observation at the School of Public Health, the W. K. Kellogg Foundation Institute and the Library of the School of Dentistry.

The scientific value of caries control will include a study of the use of dental cosmetics, remedies and preventives; the topical application of silver salts; ingestion and topical application of fluorine, and diet and nutrition.

Kenneth A. Easlick, professor of public health dentistry, chairman of the workshop, will be assisted by Philip Jay, director of the Dental Caries Research Laboratory, W. K. Kellogg Foundation Institute.

The program is being planned to appeal to directors of dental programs, health educators, public health personnel, members of councils on dental health and practitioners of dentistry. Registration is limited to ninety persons.

The members of the program planning committee are as follows: W. D. Armstrong, professor of physiologic chemistry, School of Medicine, University of Minnesota; F. A. Arnold, Jr., National Institute of Health, U.S. Public Health Service, Bethesda, Md.; Hermann Becks, professor of dental medicine, School of Dentistry, University of California.

Basil G. Bibby, director, Eastman Dental Dispensary; Samuel W. Chase, professor of

histology and embryology, School of Medicine, Western Reserve University; L. S. Fosdick, professor of chemistry, Northwestern University; Thomas J. Hill, professor of pathology, School of Dentistry, Western Reserve University.

Maynard K. Hine, dean, School of Dentistry, University of Indiana; Robert G. Kesel, professor of applied materia medica and therapeutics, College of Dentistry, University of Illinois; Henry Klein, Division of Public Health Methods, U.S. Public Health Service, Washington, D.C.

John W. Knutson, chief, dental health section, States Relations Division, U.S. Public Health Service, Washington, D.C.; Hamilton B. G. Robinson, professor of oral pathology and diagnosis, College of Dentistry, Ohio State University.

Genevieve Stearns, Department of Pediatrics, University Hospitals, Iowa City, Iowa; Robert M. Stephan, dental research section, National Institute of Health, U.S. Public Health Service, Bethesda, Md.; Ned D. Williams, Zoller Clinic, University of Chicago, and Donald A. Wallace, secretary of the Council on Dental Therapeutics, American Dental Association.

PHYSICIANS, SURGEONS COLLEGE MARKS FIFTIETH ANNIVERSARY

The College of Physicians and Surgeons, San Francisco, is celebrating its fiftieth anniversary this year. The School of Dentistry has completed its first fifty years with a total graduation of 1,858 dentists.

The School of Dentistry has also announced the retirement of William J. McDade, professor of dental histology since 1921. E. Frank Inskipp has assumed Dr. McDade's course in dental histology.

Charles A. Sweet, associate professor of operative dentistry at the School of Dentistry, and assistant in dental medicine at the School of Medicine, Stanford University, will now devote full time work to the College of Physicians and Surgeons. He will conduct postgraduate and refresher courses in children's dentistry.

New faculty members include Joseph Auerbach, who served on the faculty from 1940 to 1942 and then served in the Army Medical Corps. He has been reappointed clinical instructor in anatomy. Marshall E. Yonan, former instructor of medicine at the University of Illinois, has also been named to the anatomy department.

Ray Weinheimer has been added to the faculty in the departments of exodontia and oral surgery.

The Alumni Association of the School of Dentistry at the College has reported a registration of 537 at its recent forty-ninth annual meeting.

WORLD DENTISTRY

INTER-AMERICAN CONGRESS IN BUENOS AIRES POSTPONED

The Executive Council of the *Federacion Odontologica Latino Americana* has announced the temporary postponement of the Fifth Latin American Congress that was to have been held in October in Buenos Aires.

Juan Ubaldo Carrea, president of the federation, expressed the hope that plans may be renewed in 1948 to hold a joint Inter-American Congress with the cooperation of the American Dental Association and the Canadian Dental Association.

DENTAL EQUIPMENT BEING SENT TO CHINA

Twenty-six dental foot machines will go to China as part of the donation of medical supplies and instruments from the Medical and Surgical Relief Committee, 420 Lexington Ave., New York. Once used at the College of Dentistry at New York University, the machines were given to the committee in response to an appeal to schools and colleges for outmoded and surplus equipment.

George Gordon Agnew, professor of pathology and director of advanced study and research in dentistry at West China University, will take the equipment back with him early in September.

GERMAN DENTIST SEEKS LETTERS FROM AMERICAN COLLEAGUES

The American Dental Association has received a request from F. Straub, dentist in Gevelsberg, Germany, saying that he would appreciate hearing from American colleagues.

Any dentist wishing to correspond with Dr. Straub may do so by writing him at Mittelstrasse 19, Gevelsberg i W., Germany.

A.D.A. WORK COMMENDED IN SWEDISH DENTAL JOURNAL

Eric Hamberg, in his article, "Some General Impressions From a Study Tour in the United States," published in a Swedish dental journal of January 15, 1947, mentions in particular the various activities of the American Dental Association.

In this article Dr. Hamberg noted:

As to the American Dental Association, one undeniably becomes impressed by its vitality. . . . One of the agencies, the Bureau of Public Relations, is a very extensively developed instrument for oral and dental care. It publishes various series of pamphlets. These pamphlets are sold to dentists at very moderate prices for distribution to the patients. The pamphlets are typographically very attractive, instructive and easily understood. Especially the illustrations are of very high quality.

In writing of the efforts of the American Dental Association to establish firm relations with the dentists of other nations, Dr. Hamberg mentions the Committee on International Relations:

Its chairman is the dental surgeon, Dan Lynch, who is well known in Sweden and who attended, among others, the convention of the American Dental Society of Europe in Stockholm in 1938. In his fifth report, published in May 1946, Lynch sets forth the aims of the committee, which have already been partly accomplished. These are, among other things: 1. The creation of a special "scientific dollar" constituting a certain discount for foreign students of dentistry, dentists and teachers at dental schools. 2. The establishment of at least 21 so-called scholarships for foreign dentists. 3. Distribution of certain films of odontological interest.

GENERAL NEWS

DENTAL HEALTH CONSULTANT HEADS CHICAGO SCHOOL SYSTEM

Mr. Herold C. Hunt, recently appointed general superintendent of the Chicago school system, served as consultant to the Victory-Corps Physical Fitness Dental Program Committee and the Committee on Dental Health for Children and Youth of the Council on Dental Health of the American Dental Association.

Mr. Hunt was one of the authors of the manual for the Dental Health Program for Elementary and Secondary Schools, published by the Council on Dental Health of the American Dental Association.

Previous to his appointment as Chicago superintendent, Mr. Hunt was superintendent of schools in Kansas City, Mo.

TRADE-MARK TERM USED ERRONEOUSLY IN JOURNAL

In a classified advertisement which appeared in the June 1 issue of THE JOURNAL, the term "Master" was used in connection with the description of a Weber dental unit. As the term "Master" is a patented trade-mark of the S. S. White Dental Manufacturing Company, its use in describing a dental unit manufactured by another company was erroneous.

INTERNATIONAL CORRESPONDENCE

News from Great Britain

A United Profession

Unity is the watchword of British dentistry today. Until late in January 1947 the views of the dental profession had to be expressed through the three associations, the British Dental Association, the Incorporated Dental Society and the Public Dental Service Association. Officially the same situation still prevails, but the barrier to unity has been removed by an alteration in the articles of constitution of the British Dental Association passed at a special general meeting of the association on January 25. The revision opens membership in the association to all those on the Dentists Register, to medically qualified dental surgeons and to registered dental students. Previously only those who were qualified and registered, that is, dental surgeons, were permitted to join the association. Those who were registered but unqualified were barred from membership, together with a small group who were qualified in medicine and dentistry but who were registered only on the Medical Register. Negotiations are now proceeding to unite the three dental associations into one.

Background.—Before 1921 dentistry in Great Britain was an open profession; anyone could practice it. After the passing of the Dentists Act of 1921, no one could practice dentistry in Britain unless he was registered on the Dentists Register (or Medical Register). After 1921 it was necessary to possess a registerable qualification to be eligible for registration. Registration must be renewed each year at a fee which has varied from £2 to £4 ($10 to $20). Before the passage of the Act a number of dental practitioners practiced by virtue of having served an apprenticeship with a dentist. After the Act was passed, it was no longer possible to enter the profession by this method and those thus trained who had practiced before 1921 were asked to take an examination. Passing this examination enabled them to register, and to practice if they registered annually. Although they were registered, they had no academic qualification. These practitioners formed the bulk of the members of the Incorporated Dental Society. The British Dental Association was composed entirely of qualified dental surgeons. The Public Dental Service Association was formed in an attempt to achieve a union of both groups of the profession. During the war, unity was again emphasized and the Group Movement came into existence. The approaching National Health Service has again indicated the necessity for a united profession, and without doubt it was one of the main factors which has brought about the alteration in the constitution of the British Dental Association.

Scale of Fees Dispute

A further exchange of letters has taken place between the British Dental Association and the Minister of National Insurance. It will be remembered that the British Dental Association rejected the advice of the Joint Advisory Dental Council to accept the Minister's offer but the other two associations accepted. The British Dental Association wrote to the Minister offering alternative proposals. In his reply the Minister states that he is unable to discuss the matter except with the Joint Advisory Dental Council, with whom he made an agreement, and then only if the Council requests it. He further points out in reply to the references to the Spens Committee made by the British Dental Association that "neither the medical profession nor the Government undertook to accept these findings before the Committee had reported and its recommendations had been considered, nor would the Government have thought it right to ask the profession to do so."

The British Dental Association in its reply points out that the Joint Advisory Dental Council is an advisory body and therefore cannot enter into any agreement unless authorized to do so by the dental associations, and because the Minister thinks that this advisory body is entitled to exercise executive functions the British Dental Association is prevented from discussing its reasons for its refusal to advise the members to work his scheme. In reply to the paragraph of the Minister's letter quoted previously, the British Dental Association states that "the offer which the Minister announced in Parliament is dependent upon not only satisfactory negotiations between representatives of the profession

and the Ministry on the application of the findings of the Dental Spens Committee, but that as a preliminary to any such negotiations it will be open to the Government to refuse to accept the findings just as it will be open to the profession to refuse to accept them. . . . The Council is satisfied that when this fact is made known to the profession, they will feel even more doubtful as to the wisdom of undertaking work at present on the imposed scale of fees since the likelihood of their ever receiving an increase on that scale will clearly have become more problematical than ever."

Clinical Meetings

There are many who regard Guy's Hospital Dental School as the premier dental school in Great Britain, and in prewar days Guy's annual clinic meeting was one of the dental events of the year. The first postwar meeting was held on March 29. Among topics on the program were the following: Kostecka's operation for the correction of prognathism, the removal of cysts and third molars and apicectomy with the patient under nitrous oxide anesthesia. The last operation was demonstrated in four and a half minutes. Prosthetic demonstrations included clasp design, acrylic teeth, partial dentures and balanced occlusion. Periodontal treatment was demonstrated, including the use of zinc oxide packs with zinc acetate as an accelerator. Copper plating methods for indirect inlays, the spring bridge, acrylic pin-lay to restore the broken incisal edge of a central incisor, cavity preparation with the patient under Trilene analgesia and the treatment of periapical infection formed the main contributions from the Department of Operative Dentistry under Professor Walter E. Herbert. Professor Rushton, of the newly formed Department of Dental Medicine, showed some clinical cases, including one of hyperplasia of the condyle, one of cleidocranial dysostosis and one of ectodermal dysplasia. Orthodontic treatment, roentgenograms and pathologic and bacteriologic specimens, including an interesting hanging drop preparation of spirochetes and fusiform bacilli, were demonstrated.

At the clinical meeting of the American Dental Society of London held on March 17, the program included among other demonstrations the following: intra-osseous anesthesia, hydrocolloid impression technic for indirect inlays and the preparation of models for this technic, conservative procedures with acrylic resin, replaceable acrylic pontics for fixed bridges, preparation of teeth for jacket crowns with the patient under general anesthesia, methods of taking impressions and making castings for periodontal splints, scaling with use of compressed air, the axial inclination of the mandibular incisors and its influence on orthodontic diagnosis, the raising of the bite and the use of elastic bands in orthodontic treatment.

Kostecka's Operation

Kostecka's operation for the surgical correction of mandibular prognathism is attracting the attention of oral surgeons in Great Britain at the present time. Of course it is not new for British surgeons to treat this deformity surgically but, since C. Bowdler Henry published his paper and demonstrated a case and since the appropriate instruments have become available, surgeons have been discarding their old technic in favor of the method of Kostecka.

Successor to Major General Helliwell

Veterans who served in the European theater will be interested to learn that Col. J. P. Duguid has been appointed Colonel Commandant of the Royal Army Dental Corps, to succeed Maj. Gen. John P. Helliwell. —*John Boyes, University of Durham, Newcastle Upon Tyne, England.*

ARMY DENTAL BILL, H.R. 3336, SPONSORED BY COMMITTEE ON LEGISLATION, INTRODUCED INTO HOUSE OF REPRESENTATIVES

THE Army Dental Bill, H.R. 3336, sponsored by the Committee on Legislation of the American Dental Association was introduced into the House of Representatives by Walter E. Brehm of Ohio on May 6, 1947. The text of the bill is as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That within six months after the date of enactment of this Act the Medical Department of the United States Army shall be reorganized so as to provide for greater autonomy of the dental service in accordance with the provisions hereof.

Sec. 2. The Secretary of War shall issue such regulations as may be necessary to carry out the intent of this Act, and the procedure for the performance of the dental functions of such Dental Corps shall be defined and prescribed by appropriate directives to be issued by the Chief of the Dental Corps; to the end that the Dental Corps of the Army shall study, plan, and direct all matters coming within the cognizance of such corps, and all matters relating to dentistry shall be referred to the Dental Corps.

Sec. 3. The Dental Corps shall (1) establish professional standards and policies for the conduct of the Dental Service; (2) issue instructions, conduct inspections and surveys for the maintenance of such standards, and prepare efficiency reports; (3) initiate and direct all actions relating to the Dental Service and pertaining to facilities, equipment, supplies, research, tables of organization, planning, and personnel, including the appointment, training, classification, assignment, transfer, promotion, and demotion of personnel; and (4) submit estimates of the amount of funds needed to maintain the Dental Service.

Sec. 4. An officer of the Dental Corps of the Regular Army, who is not below the rank of lieutenant colonel and who is credited with twenty or more years of continuous service, shall be appointed as the Chief of the Dental Corps, and all matters relating to the Dental Service as a whole are to be administered by the Chief of the Dental Corps. In every Army headquarters and in every Army installation, having dental facilities, the dental surgeon of such headquarters or installation shall be regarded as a member of the technical staff, and shall be directly responsible to the commanding officer of such headquarters or installation for the administration of all matters relating to the Dental Service.

Sec. 5. The number of officers of the Dental Corps shall be not less than two officers for every thousand of the total strength of the Army authorized from time to time. The number of enlisted personnel in the Dental Corps shall be not less than four for every thousand of the total strength of the Army authorized from time to time. Hereafter, the Dental Corps shall consist of general officers and other commissioned officers of the same grades and proportionally distributed among such grades as are now or may hereafter be provided for the Medical Corps, and who shall have the rank, pay, and allowance of officers of corresponding grades in the Medical Corps.

Sec. 6. All laws and parts of laws in conflict herewith are hereby repealed and nothing contained herein shall act to reduce the grade or rank of any person.

AMERICAN DENTAL ASSOCIATION CONDEMNS DISCRIMINATION IN ARMY PROMOTION BILL, H.R. 2536

REPRESENTING the Committee on Legislation of the American Dental Association, Daniel F. Lynch testified at a hearing before the Subcommittee on Personnel of the House Committee on the Armed Services on May 16 to condemn the provisions in the Army Promotion Bill, H.R. 2536, which discriminate against dental officers in the Army Dental Corps.

The bill was prepared by the War Department and was introduced by Walter G. Andrews of New York, chairman of the House Committee on the Armed Services. The bill has been designed to establish a new and permanent system for the selection and promotion of the best qualified officers and for the elimination of the least efficient. The plan is based on the principle of limiting the number of officers of any given rank to a definite percentage of the total strength and on the principle of having selection boards to determine which officers shall be promoted.

Dr. Lynch pointed out that the bill would have a harmful effect on the efficiency of the Corps and would reduce greatly its ability to maintain the highest possible standards. He also emphasized that dental officers should be given the right of equal opportunity with other staff corps officers to become general officers in the Army. Dr. Lynch stated that H.R. 2536, by discriminating against dental officers, certainly will be damaging to a healthy state of morale in the corps and beyond question will deprive the Army of many competent dental officers.

The statement prepared by the Committee on Legislation, expressing the protest of the American Dental Association against the discrimination in H.R. 2536, is as follows:

The American Dental Association is deeply concerned regarding certain provisions in the Army Promotion Bill, H.R. 2536, which definitely discriminate against the dental officers in the Army. If this discrimination should become law, it would have a harmful effect on the efficiency of the Corps, and it would greatly reduce the ability of the Corps to maintain the highest possible standards of dental health services for the personnel of the Army. The discrimination occurs in the provisions regarding the promotion of dental officers to general officers. Officers in the Army Dental Corps are denied an opportunity to become general officers on a percentage basis and are limited and restricted to one active general officer regardless of the active commissioned strength of the Corps.

One of the purposes of the provision authorizing a percentage of the officers of the Medical Corps to become general officers is to provide an inducement to all of the officers in this Corps to improve their standards and to qualify for the honor and privilege of being a general officer in the U. S. Army. This rank is highly coveted by every worth-while officer in the Army. It is a badge of high merit and distinction which should be available to every staff corps officer in the Army on an equal basis. H.R. 2536 will definitely limit every dentist in the Army to one-seventh the opportunity to become a general officer that he would have if he were a physician or officer of the line. The Dental Corps is composed of a large group of highly skilled specialist officers, and it is neither fair nor democratic to deprive these officers of the opportunity for promotion equal to that given to the Medical Corps and the line promotion list officers.

Experience in dental health activities over

a long period of time has proved definitely that dental services will function most efficiently when such services are administered under the supervision of dentists who have been trained in administrative work and who understand the complex and unique problems peculiar to dentistry. Thus, there is a justifiable need to have dental officers with the rank of general officer to make the major policy decisions for the dental service and to supervise the dental health services being rendered to the personnel of the Army. It has been shown during the hearings that there must be general officers equal to a definite percentage of the active strength of the line and certain staff corps to administer efficiently these various groups. This principle is equally applicable to the Dental Corps.

The American Dental Association believes in the principle of the selection of the best fitted officers for promotion and the elimination of the least efficient—with both selection and elimination being on a just and equitable basis. One of the principal objectives sought by this plan is to provide a better opportunity for a reasonable career to the well qualified officer, and this is absolutely necessary if the Army is to attract the outstanding men it needs. The American Dental Association believes that all well qualified staff corps officers should have an equal opportunity for a reasonable career and that all staff corps officers should have an opportunity to become general officers on an equal basis regardless of their particular Corps.

A failure to provide an opportunity for a reasonable career to the well qualified officer will be injurious to the Army from the following standpoints:

1. It will be damaging to a healthy state of morale; and

2. It will deprive the Army of many competent officers.

The American Dental Association respectfully submits, for your consideration, that H.R. 2536, by discriminating against dental officers, will certainly be damaging to a healthy state of morale in the Corps, and beyond question will deprive the Army of many competent dental officers.

The harmful effects of such discrimination can be traced to several sources. In 1945, following V-E Day, there were so many separations from the Army Dental Corps and so few applications for commissions that it was necessary for the War Department to make a special call upon Selective Service for 1,500 dentists to fill vacancies. Largely through this pressure, considerably less than the 1,500 required were commissioned. Prior to this action, recent graduates were asked to apply for commissions but did not respond, owing principally, it is believed, to unsatisfactory conditions in the Corps and lack of opportunities at the top for those men who might desire to make the Army a career. On March 31, 1947, there were approximately 2,000 dental officers on duty and, under the present criteria for discharge, this number will be reduced to 1,500 on December 31, 1947, and to 550 in September 1948, producing an approximate shortage of from 1,200 to 1,500, unless every possible effort is made by legislation and otherwise to induce capable dentists to enter the Dental Corps.

The dental profession must strongly protest any legislation that denies to dental officers the right of equal opportunity with other officers to become general officers in the Army. The dental health services rendered by the Dental Corps officers to the personnel of the Army are tremendous in amount and of great importance in maintaining the health of the Army personnel. The Dental Corps officers of the Army in war and in peace have served their country courageously and superbly. Certainly there is no justification for denying them equal opportunity with other staff corps officers. The American Dental Association respectfully requests that the Army Dental Corps have general officers in the ratio of three-fourths of one per cent of the authorized active commissioned strength of the Dental Corps of the Regular Army.

It is felt that the general officers authorized—approximately six—would be definitely needed in the following assignments:

1. Chief of Dental Corps, Surgeon General's Office.

2. Deputy Chief of Dental Corps, Surgeon General's Office.

3. Chief of Dental Division, U. S. Air Forces.

4. Chief of Dental Division for Schools, Specialties and Research.

5. Atlantic Theater.

6. Pacific Theater.

The American Dental Association recommends to the Committee on Personnel that H.R. 2536, "A bill to provide for the pro-

curement, promotion and elimination of Regular Army Officers and for other purposes," be amended as follows:

Page 6, Section 4(a)—In Lines 16, 17 and 18, strike out the words "There is authorized one active general officer, Dental Corps, Regular Army," and insert in lieu thereof the following:

"There is authorized a strength of active general officers of the Regular Army in the Dental Corps, equal to three-fourths of one per cent of the authorized active commissioned strength of the Dental Corps of the Regular Army."

Page 71, Section 21(b), Line 8—Change the word "assigned" to "in."

WAR DEPARTMENT REVISES REGULATIONS AFFECTING DENTAL CORPS

THE War Department on April 25, 1947, announced revisions in Army Regulation 40-15 governing the Army Dental Corps. These revisions correct some of the provisions imposed by the regulations issued August 1946 and permit the Dental Corps to function essentially on the same basis as it did under the regulations issued August 1945. The April 1947 revisions of Army Regulation 40-15 are as follows:

AR 40-15, August 23, 1946, is charged as follows:

3. *Administration.*—*a.* Matters relating to the dental service as a whole are administered under the direction of The Surgeon General by the Chief, Dental Division, as assistant to The Surgeon General.

b. In a theater, army, or any other headquarters, matters relating to the dental service are administered by the dental surgeon, *through* the surgeon.

c. In the event of disagreement between the surgeon and dental surgeon of a command, as to policies pertaining to the administering of dental services, the dental surgeon will have the right of direct approach to the commanding officer.

5. *Titles.*—*a.* The Dental Corps assistant to the Surgeon General will be known as the Chief, Dental Division, and will be assigned to the Office of The Surgeon General:

6. *Duties of dental officers.*—*a.* The Chief, Dental Division, in the Office of The Surgeon General will be responsible for making recommendations on all matters relating to the dental health of the Army. He will be responsible for supervising the execution of approved plans pertaining to the dental health of the Army and for the progressive development of the dental service.

b. The dental surgeon of a theater, army post, camp, station, or any other headquarters will be responsible for the preparation of plans and policies for the progressive development of the dental service, with special reference to measures for the preservation of the general health of the command by the prevention, treatment, and control of dento-oral diseases, injuries, and deficiencies among persons subject to military control; and for advising measures to place approved plans and policies into effect. The dental surgeon will assist the surgeon in all matters that may have a bearing on the health of the command from a dental standpoint. His specific duties include the following when appropriate: . . .

(10) To route all recommendations or communications originated by him *through* the surgeon who will *forward them with* appropriate *recommendation or remarks.*

COUNCIL LISTS PRODUCTS FOR "ACCEPTED DENTAL REMEDIES"

THE Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following products in the list of Accepted Dental Remedies:

Dentifrices[1]

Stanley Tooth Powder: Composition: Each 100 gm. is stated to contain calcium carbonate (Non-Fer-Al Brand), 83.37 gm.; magnesium carbonate, 0.95 gm.; soap, 6.41 gm.; bicarbonate of soda, 3.80 gm.; gum tragacanth, 0.48 gm.; saccharin, 0.21 gm., and methyl salicylate, 4.75 gm. Manufactured by Comfort Mfg. Co., Chicago. Distributed by Stanley Home Products, Inc., Westfield, Mass.

Sodium Salts[2]

Isotonic Solution Sodium Chloride-Schenley: A brand of isotonic solution sodium chloride, U.S.P. Distributed by Schenley Laboratories, New York, in 20 cc. vials.

Denture Adherent Powders[3]

Nyko Adherent Powder: Each 100 gm. is stated to contain powdered gum karaya, 99.5 gm., and peppermint oil, 0.5 gm. Manufactured by Nyko, Incorporated, Chicago.

Nutritional Factors[4]

At its seventeenth annual meeting held in Chicago on April 5 and 6, 1946, the Council on Dental Therapeutics voted to consider water-soluble vitamins for inclusion in Accepted Dental Remedies. Shortly thereafter the distributors listed in the Council's files were informed of the Council's decision, and several firms submitted water-soluble vitamin preparations for consideration. The following acceptances are the first to be announced:

Vitamin B Complex

Nicotinamide, U.S.P.-Abbott: A brand of nicotinamide, U.S.P., in sterile solution, 100 mg. per 2 cc.; in tablets, 100 mg., 50 mg. Manufactured by Abbott Laboratories, North Chicago, Ill.

Niacinamide-Merck: A brand of nicotinamide, U.S.P. Distributed by Merck & Co., Inc., Rahway, N. J.

Nicotinic Acid, U.S.P.-Abbott: A brand of nicotinic acid, U.S.P., in tablets, 50 mg., 100 mg. Manufactured by Abbott Laboratories, North Chicago, Ill.

Niacin-Merck: A brand of nicotinic acid, U.S.P. Distributed by Merck & Co., Inc., Rahway, N. J.

Vitamin B_6 Hydrochloride-Merck: A brand of pyridoxine hydrochloride. Distributed by Merck & Co., Inc., Rahway, N. J.

Riboflavin, U.S.P.-Abbott: A brand of riboflavin, U.S.P., in capsules, 5 mg.; in tablets, 1 mg., 5 mg., 10 mg. Manufactured by Abbott Laboratories, North Chicago, Ill.

Riboflavin, U.S.P.-Merck: A brand of riboflavin, U.S.P. Distributed by Merck & Co., Inc., Rahway, N. J.

Thiamine Hydrochloride - Merck: A

1. A.D.R., Ed. 12, p. 156.
2. A.D.R., Ed. 12, p. 24.
3. *J.A.D.A.* 33:1593 (December 1) 1946.
4. A.D.R., Ed. 12, p. 180.

brand of thiamine hydrochloride, U.S.P. Distributed by Merck & Co., Inc., Rahway, N. J.

Vitamin C

Ascorbic Acid, U.S.P.-Abbott: A brand of ascorbic acid, U.S.P., in tablets, 50 mg., 100 mg. Manufactured by Abbott Laboratories, North Chicago, Ill.

Ascorbic Acid, U.S.P.-Merck: A brand of ascorbic acid, U.S.P. Distributed by Merck & Co., Inc., Rahway, N. J.

Admission of a product to the list of Accepted Dental Remedies means that the product and the methods by which it was marketed at the time of consideration were not found to be in violation of the Council's published rules. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics which is available upon request, and inquiries are welcomed.—*Donald A. Wallace, Secretary.*

COMMITTEE ON PROSTHETIC DENTAL SERVICE

PROSTHETIC DENTAL SERVICE CONFERENCE URGES UNIFIED LABORATORY ORGANIZATION

Formation of a unified national organization of dental laboratory owners, to which all ethical dental laboratory owners in the nation would be eligible for membership, was recommended at a national conference conducted in Chicago, June 13-15, by the Committee on Prosthetic Dental Service of the American Dental Association.

The conference rejected bids for official recognition from spokesmen of laboratory groups and recommended that the American Dental Association withhold recognition "until such time as but one national organization is created and satisfies the requirements of the American Dental Association."

Pending creation of a single national laboratory organization, the conference unanimously urged that the formation of state dental laboratory organizations be encouraged.

The conference also adopted a number of resolutions dealing with the regulation of dental laboratories and the education and training of dental laboratory technicians.

Delegates unanimously approved a declaration that the regulation of dental laboratories and dental laboratory technicians is "of concern to the dental profession."

They also adopted a general recommendation that no legislation for the regulation and licensure of dental laboratories and dental laboratory technicians be sponsored by state dental societies at the present time.

On the insistence of delegates from several of the larger states where legislative action is being contemplated, this statement was followed by a qualifying clause reading:

"However, if in the good judgment of the dental societies in the individual states, such legislation is necessary, it should conform to the specifications laid down by the Committee on Prosthetic Dental Service of the American Dental Association."

The conference unanimously approved the principle of accreditation of dental laboratories as approved by the American Dental Association House of Delegates in 1944 and urged that all state dental societies place accreditation plans in operation as soon as possible.

In the field of education and training, the conference recommended that the basic training of dental laboratory technicians should be conducted "under the auspices of an accredited dental school," and urged endorsement of requirements of the American Dental Association Council on Dental Education for the accrediting of courses for the training of dental laboratory technicians.

Delegates also urged that the "multiplication of proprietary schools" for the training of laboratory technicians and the establishment of training courses for laboratory technicians at the secondary school level be discouraged.

More than fifty delegates, representing prosthetic dental service committees of the dental societies of forty-three states and the District of Columbia, participated in the conference. Dr. Harold W. Oppice, of Chicago, American Dental Association trustee for the eighth district, was the conference chairman. Others participating in the three day meeting included Dr. Willard Ogle, of Dallas, American Dental Association trustee for the twelfth district, several American Dental Association staff members, and the five members of the American Dental Association Committee on Prosthetic Dental Service: Drs. Henry O. Lineberger, Raleigh, N. C., chairman; Carl O. Boucher, Columbus, Ohio, secretary; Herbert W. Mason, Indianapolis; Luzerne G. Jordan, Washington, D. C.; and Joseph M. Glaser, Jamaica, N. Y.

The conference program was divided into four general headings, education of dental laboratory technicians, organization of dental laboratories and dental laboratory technicians for the purposes of liaison with the dental profession, regulation of dental laboratories and dental laboratory technicians, and the development of a working program.

Speakers for the section on education were Dr. Harlan H. Horner, of Chicago, secretary of the American Dental Association Council on Dental Education; Dr. Stanley Standard, New York; Mr. Paul Stough, Cleveland, Ohio; and Dr. E. Howell Smith, Philadelphia.

Organization section speakers included Dr. C. Willard Camalier, Washington, D. C., assistant American Dental Association secretary; Mr. Duncan Marshall, Detroit, president of the Dental Laboratories Institute of America; Mr. Adolph Froehlke, of Oshkosh, Wis., representing the Federation of State Dental Laboratory Organizations; and Mr. O. A. Nachbar, Indianapolis, representing dental laboratory technicians.

Speakers for the section on regulation were Dr. George Boos, Minneapolis; Mr. James Rickert, Grand Rapids, Mich.; Dr. Carl O. Flagstad, Minneapolis, chairman of the American Dental Association Committee on Legislation; and Dr. C. Raymond Wells, Brooklyn, past president of the American Dental Association.

Speakers for the final section included Dr. Lineberger; Morris Thompson, Los Angeles; Victor L. Steffel, Columbus, Ohio, and D. E. Gallagher, Parkersburg, W. Va.

The full text of recommendations follows:

Education

The conference adopted the following resolutions relating to the education of dental laboratory technicians:

1. That the basic training of dental laboratory technicians should be conducted under the auspices of an accredited dental school.

2. That the requirements for the accrediting of courses for the training of dental laboratory technicians which have been established by the Council on Den-

tal Education should be endorsed.

3. That the Council on Dental Education be urged to continue its study of vocational schools established upon a non-profit basis, above the secondary school level by responsible agencies, for the training of dental laboratory technicians with a view to the possible accreditation of such schools.

4. That the Committee on Prosthetic Dental Service of the American Dental Association discourage the multiplication of proprietary schools for the training of dental laboratory technicians.

5. That the Committee on Prosthetic Dental Service of the American Dental Association promote relationships between the dental schools, the laboratories and the profession, leading to the employment of the graduates in dental technology with opportunity for added experience and for prompt advancement.

6. That the requirements for the accreditation of a laboratory should include a discovery of the attitude and purpose of the laboratory in the on-the-job training of dental laboratory technicians and a study of the opportunities being offered for effective training.

7. That the Committee on Prosthetic Dental Service cooperate with present dental laboratory technicians in making available further instruction for those who may desire it.

8. That the training of dental laboratory technicians at the secondary school level be discouraged.

Organization

The following recommendations on the organization of dental laboratory owners and technicians were adopted:

1. That state and local dental societies be requested to extend invitations to dental laboratory owners and dental laboratory technicians to attend clinical sessions, which do not include operative procedures, of state and local dental society meetings in such manner and to whom the society may determine.

2. That the prosthetic dental service committees give study to and prepare definitions of master technician and junior technician and other classifications deemed desirable in order that this information may be available in future discussions with laboratory owners and technicians.

3. In view of the confused picture with reference to the formation of a national dental laboratory organization it is moved that this conference should give all encouragement at the present time to the formation and functioning of state dental laboratory associations at state levels.

4. It is recommended that as a result of the discussions at its conference held at Chicago, June 13-15, a challenge again be issued to the dental laboratory owners of the United States to consummate one national organization, which will be representative of the ethical dental laboratories of the nation, to which all ethical dental laboratory owners will be eligible for membership, such organization to have a structure similar to that of the American Dental Association.

It is further recommended that until such time as but one national organization is created and satisfies the requirements of the American Dental Association, no official recognition be given to any national group of laboratory owners.

Regulation

The following recommendations regarding regulation of dental laboratories and laboratory technicians were adopted:

1. Self-regulation: It is the opinion of this panel that self-regulation is the ideal and does work satisfactorily in some states; in many other states it has proved inadequate and other measures should be considered. In those states where harmony exists under the present procedure

it is recommended that this method be not disturbed, but be encouraged. It is also the opinion of this panel that regulation of dental laboratories and dental laboratory technicians is of concern to the dental profession.

2. Legislation: This conference recommends that no legislation for the regulation and licensure of dental laboratories and dental laboratory technicians be introduced at this time. However, if in the good judgment of the dental societies in the individual states, such legislation is necessary, it should conform to the specifications laid down by the Committee on Prosthetic Dental Service of the American Dental Association.

3. Accreditation: That we approve the principle of accreditation of the American Dental Association as approved by the House of Delegates at its eighty-fifth meeting in 1944 with the purpose of improving professional laboratory relationships and laboratory procedures within the profession and in the laboratory craft in the interest of public welfare and that this plan be placed in operation by the state societies as soon as possible with such modifications as may be approved by the Committee on Prosthetic Dental Service of the American Dental Association.

Because it was the opinion that more funds were needed by the state prosthetic dental service committees to effect the operation of the accreditation plan of the American Dental Association, therefore, the panel recommends to the Committee on Prosthetic Dental Service of the American Dental Association that it give consideration to the matter of returning to the state prosthetic dental service committee a larger proportion of the accreditation fees.

●

Current Trends in Health and Welfare Programs.—In this country, some of the earliest schemes designed to provide security against sickness for industrial workers were established by employers. Since they were started in industries which most needed them, such as railroading, mining and logging, where workers lived isolated from the rest of civilization, in remote and inaccessible areas, these plans were most often of the service type. That is, physicians, nurses, hospital facilities, and so on, were brought to the workers, and the benefits which workers received were professional services, rather than cash indemnities. Most of these schemes were contributory, although a few were financed entirely by the employer, as an inducement to get laborers to come to the area and to remain there.

Concomitant with this trend, employers in more populous areas, better supplied with professional personnel and facilities, were energetic in developing organizations for the financial relief of their incapacitated workers. These came to be known as sickness benefit or mutual benefit societies. The theory in this type of scheme is that the cash benefits may be used to purchase medical services, thereby providing health security indirectly.

Finally, in addition to these two types of health and welfare plans sponsored by employers, there was a parallel growth of benefit associations under the auspices of workers themselves. These latter may be considered to be direct outgrowths of the Roman *collegia*, the medieval guilds and the European friendly societies. Much of the popularity of early trade unions was due to their having embraced this type of beneficial activity.

Conforming to the tradition of their prototypes, labor-sponsored mutual sick-benefit associations also operated on the cash indemnification principle. For groups of workmen to attempt to organize medical service plans by themselves without any outside financial assistance was, with a few noteworthy exceptions, an impossible task. As a matter of fact, even their cash sickness benefits were more often than not on a shaky actuarial basis, with the result that they steadily decreased in popularity and membership in the years before the war, giving way more and more to contributory schemes in which the risk was assumed by commercial insurance carriers. —*Lee Janis, "Current Trends in Health and Welfare Programs." Indust. Hyg. Newsletter 7:7, April 1947.*

CURRENT LITERATURE

Journal of Oral Surgery
July 1946

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*Mixed Tumors of the Lip. J. L. Bernier, Washington, D. C.—193.

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*Arthroplasty with Fatal Outcome: Report of Case. E. F. Tholen, Los Angeles.—238.

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*The Present Status of Oral Surgery as a Specialty. D. B. Parker, New York.—250.

*Ankylosis and Trismus Resulting from War Wounds Involving the Coronoid Region of the Mandible: Report of Three Cases. J. B. Brown and L. W. Peterson, St. Louis.—258.

The Basic Medical Sciences in Graduate Training in Oral Surgery. C. W. Waldron.

"The American College of Surgeons has made an intensive study of graduate training in surgery and in the numerous specialties of surgery. Under the direction of an illustrious committee of nationally known surgeons, fundamental requirements and minimum standards were established to ensure a general and widespread improvement in graduate training in surgery together with an increase in the opportunities available by affiliation with teaching hospitals. The primary purpose of all activities of the College is the general elevation of surgical standards with the ideal of making available to the greatest possible number of people the benefits of the best surgical care and scientific knowledge. . . .

"Three plans have been approved: (1) graduate training in surgery in university or teaching hospitals supervised by departments of surgery of medical schools and graduate schools; (2) fellowships in recognized clinics and other organized groups, and (3) additional plans of graduate training in surgery in selected hospitals. . . .

"Applied bacteriology, physiology, biochemistry and pharmacology are such essential considerations in the study and treatment of patients that advanced study of these basic sciences must be centered in the clinical work of the hospital. The staff surgeons are expected to be continuously responsible for this teaching with the help of specialists from the preclinical departments at conferences and seminars. As previously noted, the emphasis of modern surgery is now on physiology and biochemistry with the result that morbidity and mortality rates are steadily declining by

virtue of improved preoperative management, safer anesthesia, improved treatment of shock and better postoperative care. These applied basic science fundamentals to surgery are outlined by Peltier and Kolouch as (1) 'a careful preoperative determination of the cardiovascular-renal pulmonary reserve of the patient with correction of such abnormalities when found; (2) careful and adequate preoperative preparation of the starved and/or dehydrated patients with careful attention to the establishment of adequate hydration, proper electrolyte balance, replenishment of protein stores, replacement of lost hemoglobin, and correction of vitamin deficiencies; (3) recognition and performance of deliberate, physiologically sound surgical procedures carried out with a minimum of unnecessary trauma, careful hemostasis, thorough asepsis and use of proper suture materials and technics; (4) measurement of blood and fluid losses with volumetric replacement during surgery; (5) employment of safe anesthesia which affords maximum relaxation with a minimum depression and anoxia, administered by competent, alert anesthetists; (6) and finally, a planned management of convalescence . . . directed toward the prevention of disabling or even fatal postoperative complications.' . . .

"The present programs in four universities will accommodate but a limited number of graduate students: probably less than twenty-five. Several hundred applications have been made for enrollment in these courses which lead to a graduate degree. It becomes obvious that the situation may be handled by adopting the concept of the College of Surgeons program which is based on the assumption that probably less than one-third of the graduate students will qualify for an advanced degree. It is further evident that adequate basic science instruction can be arranged for in more than two hundred hospitals approved by the College of Surgeons in which the amount of inpatient and outpatient material justifies a graduate program in oral surgery. . . .

"It is the duty and responsibility as well as the privilege of the experienced oral surgeons of America in behalf of the public and the returning dental officers to support unselfishly and wholeheartedly the new approved programs for hospital dental services, internships and residencies. They should enter actively into the reorganization of these programs and into the organization of new services and thus uphold the best tradition of the healing art."

Mixed Tumors of the Lip. J. L. Bernier.

Bernier reports thirty-eight primary mixed tumors of the lips from the records of the Army Institute of Pathology. Of these, 92 per cent were situated on the upper lip.

"The frequent occurrence of mixed tumors on the upper lip might be explained by the rather complex embryologic background of the upper arch. It is conceivable that enclavement of epithelial remnants might well take place at the time of fusion of the palatine processes with the medial nasal process, the location of the tumors on either side of the lips tending to give weight to this suggestion. Initially the fusion of these processes is an epithelial suture which is soon 'broken up' by ingrowing and proliferating mesoderm. Thus, epithelial rests may remain in this area, such foci often resulting in the formation of globulomaxillary cysts. It is possible that this process might also lead to the formation of mixed tumors in this location."

Another theory, held by Stewart, Foote and Becker, of the etiologic background of muco-epidermoid tumors is suggested as a reasonable explanation for the formation of certain of the mixed tumors of the lip, although only a small number (about 5 per cent) of the cases in this report could be classified unquestionably as muco-epidermoid tumors.

Bernier concludes that mixed tumors of the lip seem identical in most respects to those occurring elsewhere in the body. The rather marked epidermoid tendencies of the epithelium and the relative infrequency of the bizarre histologic picture usually attributed to mixed tumors are features worthy of note.

Bilateral Osteotomy of the Mandibular Rami for Correction of Prognathism in an Edentulous Mouth: Report of Case. R. G. Peterson.

According to preoperative cephalometric roentgenograms, the width of the rami in this case allowed a maximum of ⅞ inch setback. Incisions were made on both sides at a position just below the lobe of the ear and about 1 cm. behind and below the posterior border of the mandible, extending for a distance of 1¼ inches down along the posterior border. Resection was performed with hand saws. After the setback, the resected fragments were

wired at the site of operation. A drain was inserted, and drainage of parotid fluid continued for about fifteen days after operation.

A modified Gunning splint was used intraorally and an elastic bandage was applied for support of the mandible postoperatively.

Xanthomatosis (Schüller-Christian's Disease): Report of Dental Findings in One Case. L. T. Austin.

Austin reports a case of xanthomatosis in a boy, aged 3, in which the bony destruction of the mandible is typical of that found in other bones of the skull. Owing to the destruction of alveolar bone, three teeth were lost spontaneously and other deciduous teeth were loose.

Dentigerous Cyst: Report of Case. E. C. Stafne.

A case of dentigerous cyst that involved an unerupted mandibular third molar in a man, aged 63, is reported. The cyst had become infected, and examination revealed a fistula in the mucous membrane.

Microscopic examination revealed a cyst lining of squamous epithelium and numerous cholesterol crystal clefts. The offending tooth showed evidence of resorption and a subsequent formation of cementum over the dentin in the resorbed area, which probably occurred after cessation of growth of the cyst.

Median Anterior Maxillary Cyst: Report of Case. E. C. Stafne.

The cyst was removed from the palatal side in an edentulous man, aged 69. After removal, a dressing was inserted and replaced until the cavity was rather well filled with soft tissue. Microscopic examination revealed a cyst lining of squamous epithelium. The case is well illustrated.

Central Giant-Cell Tumor: Report of Case. E. C. Stafne.

Stafne reports and describes a case of benign central giant-cell tumor of the bone which involved the symphysis of the mandible in a woman, aged 29. Four anterior incisors were removed at the time of enucleation of the tumor. The surgical defect was curetted and cauterized by chemical means. The author mentions the importance of periodical postoperative roentgenographic examinations for signs of possible recurrence.

Fundamentals and Technic of Surgical Periodontal Packing. R. H. Blanquie.

Blanquie uses a packing that consists of zinc oxide, hydrogenated rosin and zinc acetate in proper proportions. The liquid consists of eugenol and olive oil. The author discusses the physical and chemical properties of the cement packing and the method and technic of applying the packing to the teeth and surrounding structures. He also uses an acrylic splint, devised by Lattig, which retains and protects the sedative packing within the interproximal spaces and about the teeth. The splint is left in place for ten days to two weeks.

Cystic Adamantinoma (Ameloblastoma): Report of Case. R. G. Knapp.

Knapp reports an ameloblastoma which occurred in the edentulous mandible of a woman, aged 70. The tumor was enucleated under nitrous-oxide-oxygen anesthesia. The case is well illustrated with preoperative and postoperative roentgenograms. Recovery was uneventful.

Fracture of the Mandible: Report of Case. R. G. Knapp.

Knapp reports a case of fracture of the mandible at the angle after removal of an impacted lower third molar. The fracture was reduced and immobilized by the use of a bite-block splint and intermaxillary wiring.

Cholesteatoma of the Maxilla: Report of Case. R. G. Knapp.

A case of cholesteatoma associated with an impacted maxillary cuspid is described. The maxillary sinus was exposed and found to be filled with a pure white crystalline substance which peeled off in layers like an onion and which had the characteristic odor of cholestrin.

Arthroplasty With Fatal Outcome: Report of Case. E. F. Tholen.

A case of ankylosis of the left temporomandibular joint in a woman, aged 23, is described. The disability resulted from fractures of the mandible at the age of 4. At the age of 7, both mastoid processes were operated on, and ever since there was occasional slight offensive discharge from both external ear canals. A preoperative diagnosis was made

of ankylosis of the left temporomandibular joint, deformity of the mandible and chronic bilateral otitis media and mastoiditis. The day after resection of the left condyle the patient showed signs of brain involvement. Postoperative therapy included plasma, penicillin and sulfadiazine. The patient expired about one month after the operation. Autopsy revealed localized osteomyelitis of the right dural plate and surrounding bone; red softening of the midbrain, and thrombophlebitis of both lateral sinuses. The operative wound was healed and dry.

Mandibular Fracture With a Tooth in the Fracture Line: Report of Case. F. G. Repass.

A case is reported of mandibular fracture at the angle through the alveolus of the lower third molar, splitting the tooth so that the crown and distal root remained in the posterior fragment. The tooth was used as a splint to reduce the posterior fragment when elastic band traction was applied to wire loops on the other teeth. There were no complications. At the end of about five weeks the tooth was removed. (Editor's note: "In cases of this type presenting considerable mobility, the fractured mesial root in the anterior fragment or in the line of fracture may be removed before tight and secure rubber bands or tie wires are applied to hold the teeth in occlusion. Removal of the root provides additional drainage of the line of fracture and tends to reduce the incidence of infection.")

Impacted Right and Left Mandibular Third Molars With Inferior Dental Nerves Passing Through the Mesial Roots: Report of Case. F. G. Repass.

Repass reports a case that involved sectioning of the inferior dental nerves in removal of two impacted lower third molars. The nerves passed through holes between the roots. Eleven months after operation the patient still had anesthesia of the lower lip.

A Technic for the Removal of Salivary Calculi from Wharton's Duct. E. E. Lyman.

Three cases of salivary calculi in Wharton's duct on the right side are reported. A fishhook suture needle was used to elevate and support the tissues of the floor of the mouth during removal of the calculi. The technic is well illustrated with drawings.

The Present Status of Oral Surgery as a Specialty. D. B. Parker.

Parker briefly outlines the history of the specialty of oral surgery. In 1944 the Massachusetts General Hospital outlined the scope of the specialty. That institution declared the following to be definite oral surgical operations:

"Extraction of teeth or extraction with alveoloplasty.

Odontectomy (excision of impacted teeth).

Treatment, incision and drainage in cellulitis.

Treatment of sublingual, submandibular, and submaxillary abscess when of dental origin.

Reduction of fractures of upper and lower jaws including the treatment of lacerations of the face.

Treatment of osteomyelitis of upper and lower jaws.

Arthroplasty and osteo-arthrotomy for ankylosis of the mandibular joint.

Osteotomy for congenital and acquired deformities of the jaw.

Excision of bone cysts and local tumors of the upper and lower jaws when referred from the Tumor Clinic.

Treatment of diseases of the soft tissues of the mouth.

Excision of abnormal frenum of the lip and tongue.

Excision of cysts of the mucous glands and cysts and stones of the salivary glands."

In discussing the present status of the specialty the author states, "There is a distinct place for the dentist who is adequately trained in applied basic medical sciences and in oral surgery. There are no short cuts to such training. It must be based on training relatively equivalent to that required by the other medical specialties. While a medical degree in addition to the dental degree is very useful and gives considerable prestige to the possessor, it is not the essential factor. Hospital training is essential as well as fundamental dental training in addition to an adequate background in applied basic medical sciences. Training and ability as well as certification by a board made up of the outstanding specialists in America are the stepping stones to recognition.

"In the effort to establish residencies in oral surgery in the larger teaching hospitals, some authentic organization or board must speak for oral surgery in view of the fact that it is not listed under the group of recognized medical specialties. It is the hope of many oral surgeons that the American Board of Oral Surgery will be completely organized and will function without delay as it seems imperative at this time."

Ankylosis and Trismus Resulting From War Wounds Involving the Coronoid Region of the Mandible: Report of Three Cases. J. B. Brown and L. W. Peterson.

Brown and Peterson report three cases from a series of 27 cases of limited mouth opening. Of the 27 there were eight cases of actual bony ankylosis involving the coronoid process.

The operative treatment for both fibrous and bony ankylosis involving the coronoid process is the removal of this process and adjacent involved bone. An incision is made in the maxillary fornix, extending down the anterior border of the coronoid process, and the ascending ramus is exposed by blunt dissection. The periosteum is excised and reflected from the bone. The ankylosis is chiseled free. Usually the coronoid process is removed, creating a sufficiently large defect to make reunion impossible. The crux of the entire operative procedure is the removal of a sufficiently wide section of bone and thorough debridement of the wound before tissue closure. It is important to free all of the tendinous attachments of the temporal muscle before chiseling loose the ankylosed segment. If this is not done, the resultant temporal muscle spasm will displace the freed tip of the coronoid process into the region of the temporal fossa where it is almost impossible to recover.—*Herman L. Hubinger.*

Finger Infection Caused by Fusobacterium and Spirochetes with a Discussion of Fusospirochetal Infection of the Finger. L. Lahelle. Acta dermat.-venereol. 25:264, November 1946.

A woman had an ulceration beneath the nail of her right fourth finger. The lesion was of several months' duration, and removal of the nail revealed an "irregular greyish, dingy, pus-covered and foul smelling ulcer producing a bloody-serous stinking fluid." Pain was minimal. Microscopic examination in a dark field showed spirochetes and fusiform bacilli typical of Vincent's infection. The patient had pyorrhea and a habit of biting her nails. Much work was done on the bacteriologic examination, and the etiologic agents were firmly established. The patient was treated with neoarsphenamine locally and intravenously, and sulfathiazole orally and locally, and the lesion healed. The diagnosis of such lesions is dealt with, and the importance of the history of origin and bacteriologic examination is stressed. Eighteen references are used.—*D. F. Mitchell.*

An Appraisal of the Focal Infection Theory with Special Reference to Arthritis. Richard Lyons. J. Endodontia 1:39, December 1946.

The author reviews the trends of thought on the subject of focal infection during the past thirty years, since the days of Billings and Rosenow. This discussion is directed toward the aerobic nonhemolytic Streptococcus viridans. Attention is called to the wide distribution of this micro-organism in the normal body and its apparently low pathogenicity. In cases of bacteremia with tissue reactions, other pathogenic types of organisms are usually involved.

The author is unable to explain why foci present in the body for years may suddenly cause disease or why similar disturbances may occur in young children and adults in the absence of demonstrable foci. He cannot accredit these disturbances to bacterial toxins or allergies. The use of the sulfonamide drugs and penicillin seldom relieves cases of supposed focal infection, and these drugs have wholly failed in cases of rheumatoid arthritis or acute rheumatic fever. Patients with acute rheumatic fever, however, have been improved by good general care and nutrition. No disease alleged to come from foci of infection has been specifically proved to be due to localization of streptococci.

The author attributes many miraculous cures which have been cited to psychologic reactions and maintains that they could not possibly have resulted from the elimination of infection. Others he believes to be spontaneous or coincidental.

Cases are cited in which there is an acute exacerbation of the symptoms after surgical

disturbance of a focus of infection, while other acute infections may disappear after the eradication of a focus. Of this latter group the most common is the clearing of iritis after the removal of prostatic infection or the removal of the teeth or tonsils. In such cases there appears to be a relation.

In a discussion of affections of the joints the author calls attention to the fact that they may result from trauma, allergy, loss of nerve supply, gout or uric acid tophi. Chronic suppurative lung disease or carcinoma of the bronchi and certain vascular diseases may produce disturbances of the joints. There are also many instances of pains of the joints and muscles without any apparent local disease. These pains are often associated with psychologic disturbances and may improve if the patient believes that a focus of infection has been removed.

In hypertrophic or degenerative arthritis there is no evidence of an infective cause. In chronic rheumatoid arthritis the clinical course suggests low grade infection. However, it is often associated with cancer, allergic states and diffuse vascular disease. In this type of disturbance of the joints Streptococcus viridans may often be recovered, and in these cases the question of focal origin is still debatable. In a series of 300 cases, patients who were not subjected to surgical interference showed more improvement than those whose teeth were removed. In a series of 200 cases only 7 patients were benefited by tonsillectomy and none improved after treatment of the teeth and sinuses.

Acute rheumatic fever is not cured by the removal of tonsils or teeth, but the attacks may be intensified after surgical interference. The use of the sulfonamide drugs decreases the hemolytic infections of the throat and decreases the recurrence of attacks. In all cases of rheumatic fever, premedication with penicillin or the sulfonamide drugs before extraction of teeth or surgical treatment is strongly advised to avoid the danger of subacute bacterial endocarditis.

The author sees no relation between nephritis and infected teeth, since the infection concerned is usually a hemolytic streptococcus.

He concludes with the statement that in his clinical experience there is little evidence to support the theory of focal infection, and he advises against the sacrifice of healthy or slightly abnormal teeth in the treatment of arthritis, rheumatic fever or nephritis.—*R. W. B.*

Effects of Vitamin C Deficiency and Starvation Upon the Toxicity of Procaine. Richard K. Richards and K. Kueter. Anesth. & Anal. 26:22 (January-February) 1947.

Depletion of vitamin C results in a rapid and marked increase in sensitivity to the convulsive action of procaine in guinea pigs. This finding parallels the prolongation of the hypnotic effect of certain barbiturates in vitamin C deficiency previously reported by the authors. Starvation likewise lowers the resistance to the toxic action of procaine. Possible pathophysiologic reasons for these conditions and treatment are discussed. The results of these experiments suggest that liberal administration of dextrose and vitamin C prior to the use of large doses of procaine may increase the resistance against toxic side effects of this drug, particularly in patients in a poor nutritional condition.—*D. A. W.*

Changes in Oral Structures of the Dog Persisting After Chronic Overdoses of Vitamin D. Hermann Becks, Daniel A. Collins and Ruth M. Freytag. Am. J. Orthodont. & Oral Surg. 32:463, August 1946.

In this experiment 1 dog received 10,000 international units of vitamin D_3 (Du Pont) and 10,000 international units of vitamin A per kilogram of weight every day for one hundred and twenty-seven days, a total of 1,270,000 international units of vitamin D_3, and the dog was sacrificed at 386 days of age. Another dog received vitamin D_2 for a period of one hundred and forty-five days, a total of 1,450,000 international units, and was sacrificed at 396 days of age. Two other dogs of the same age were used as controls.

Both dogs receiving excessive doses of vitamin D_2 and vitamin D_3 over a five month period manifested profound pathologic changes, including distorted and deformed roots, pathologic calcification of the periodontal membrane, hypercementosis, pulp stone formations and advanced periodontosis. The authors conclude that the administration of excessive doses of vitamin D is unsafe.—*R. W. B.*

CASES AND COMMENTS

Standardization in Recording Dental Examination and Diagnosis

To the Editor: I believe that standardization of charts for recording dental examination and diagnosis is greatly needed. I have before me five specimens of such records, three produced commercially and two used by agencies of the federal government. There are, of course, many more forms being used, but these will suffice for the purpose of this discussion. All these forms have a space in which to fill in the name and address of the patient, but only on this point do they achieve unanimity.

Specimen 1 (commercial) furnishes a diagrammatic sketch of the crowns (but not the roots) of the permanent teeth. The mouth is divided into quadrants and the teeth are numbered from 1 through 8 distally, starting from the midline of the upper and lower jaws. A code of 34 numbers representing operations to be performed is provided, but no provision is made for recording any previous work which might have been done.

Specimen 2 (federal government) uses the same system of numbering teeth as Specimen 1. No sketch of the teeth is given. A code of circles and lines for describing the present condition of the teeth and the work done previously is provided.

Specimen 3 (commercial), from a visual aspect, is the best form. It provides a sketch of the crowns of the deciduous teeth; two views of the adult teeth, one of which also shows the roots, and a plan for sketching prosthetic work. No plan for description is provided. The deciduous teeth are not numbered. The permanent upper teeth are numbered 1 through 16, with the right third molar as 1 and the left third molar as 16. The permanent lower teeth are numbered 17 through 32, with the right third molar as 17 and the left third molar as 32.

Specimen 4 (commercial) uses the same numbering of upper teeth as does Specimen 3, but the numbering of the lower teeth is in the reverse direction, the left third molar appearing as 17 and the right third molar as 32. No provision is made for recording deciduous teeth or prosthetic work, and no plan for description is provided.

Specimen 5 (federal government) uses the same system of numbering permanent teeth as Specimen 4. It has no sketches. It has a thorough system of describing the condition of the teeth, including the location of the cavities; existing fillings (but not the filling material used); prosthetic work and condition; condition of tissues surrounding the teeth, and treatment indicated.

These five samples may be considered sufficient to prove that at present there is a wide variety in the methods being used to record oral examination and diagnosis. There seems to be no rational basis for the existence of this condition. In the matter of handing out dental equipment, Nature showed no discrimination between race, color, religion or sex. Why, then, could not dental records be standardized?

In this direction, I believe the American Dental Association should take the lead and should enlist the cooperation of dental colleges and government agencies. This step would simplify greatly the dissemination of dental information and the recording of examination and diagnosis.—*Herbert Levington, D.D.S., 1001 Realty Bldg., Savannah, Ga.*

Study of Replanted Upper Lateral Incisor.

By Theodore Katz, D.D.S., Bronx, New York.

On January 31, 1941, a boy, aged 15, was brought to my office about fifteen minutes

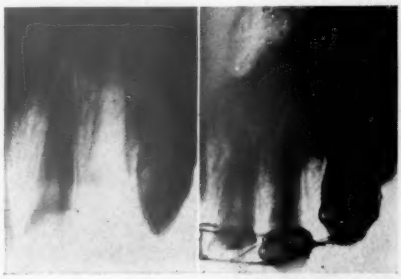

Fig. 1.—Left: Immediately after accident (January 31, 1941). Right: Replanted upper right lateral incisor wired to upper right cuspid and left central incisor

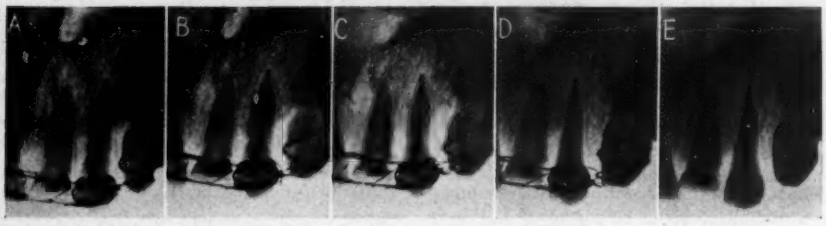

Fig. 2.—A, February 2, 1941; B, February 7, 1941; C, February 11, 1941; D, February 26, 1941; E, removal of wires, on March 6, 1941. Note that resorption is commencing

after he had fallen and hit his face on a street curb. Examination revealed that the incisal margin of the upper left central incisor was fractured, the entire crown of the upper right central incisor was missing and the upper right lateral incisor was entirely missing from its socket (Fig. 1, left).

A capping was placed on the exposed pulp of the right central incisor. The lateral incisor, which was carried in by the patient, was intact except for a slight chip on the mesioincisal margin. It was placed in Camphophenique for ten minutes. The nerve then was removed under aseptic conditions, and the canal was slightly enlarged. The tooth was replaced in Camphophenique for five minutes.

The canal was filled with gutta-percha points and root canal paste. The lingual opening was sealed with oxyphosphate of zinc cement. The tooth was then placed in a normal saline solution for ten minutes.

The socket was irrigated with saline solution, and the lateral incisor was replanted in place, approximately one and a half hours after the accident. Steel ligature wire was used to wire the tooth to the upper right cuspid and the upper left central incisor (Fig. 1, right). A matrix of black compound was molded around these teeth for protection. A bandage was applied for the night, and cold compresses were recommended to control the swelling.

The patient was seen daily for the next several weeks. During this period the wires were adjusted and the mouth irrigated with saline solution (Fig. 2, *A-D*). The compound matrix was removed February 3. On February 13 the patient felt no pain on light percussion of the tooth. On March 6 the wires were removed and the lateral incisor was firmly in place (Fig. 2*E*). The lower teeth were stoned and polished until the incisor did not touch them in any excursion of the mandible.

The case can be followed up to the early part of 1943 by observing the roentgenograms in Figure 3, which are of histopathologic interest. All this time the tooth remained firm, and the patient never presented any clinical symptoms. Both the patient and I went into the service in 1943; however, the patient was able to send one more roentgenogram of the region taken in 1944 (Fig. 4, left).

The patient related that, early in 1945, there was considerable swelling and pain over the apex of the replanted tooth. Later he ob-

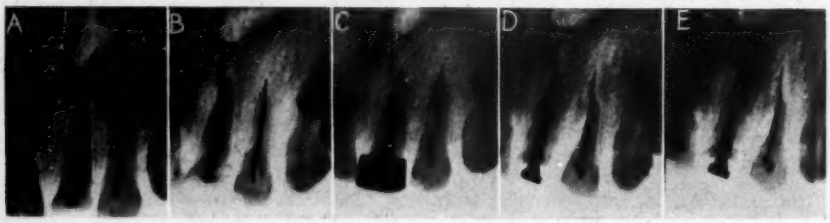

Fig. 3.—A, May 1, 1941; B, October 12, 1941; C, December 22, 1941; D, October 13, 1942; E, March 26, 1943. Note advanced resorption in C, D and E

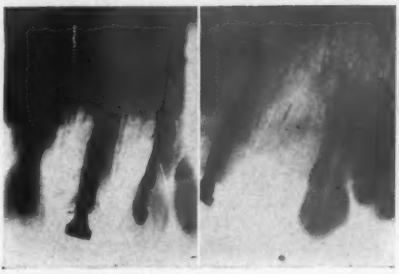

Fig. 4.—Left: April 10, 1944. Right: February 15, 1947. Note the small piece of gutta-percha left behind in the region

tained relief when pus began to drain from the apical region. In February 1945 the tooth was extracted. The patient is now having his mouth rehabilitated (Fig. 4, right).—*2802 Grand Concourse.*

Need for Internships in Dentistry for Children

To the Editor: A community dental health planning program was conducted at Columbus, Ohio, December 6, 7 and 8, by the Ohio Department of Health. A representative from each of the twenty-three component societies of the Ohio State Dental Society was present. The purpose of the meeting was to formulate a program for the present day dental needs of Ohio. One of the fifteen specific recommendations made at the meeting asks for the establishment of one year internships in dentistry for children for Ohio dental graduates.

The establishment of dental internships for Ohio dental graduates is greatly to be desired. Many private dental practitioners would be willing to pay for the services of a recent dental graduate for a period of one year. The graduate would be greatly benefited by association with a practicing dentist. He would be able to secure from such an internship direct contact with patients, which would be valuable to him in establishing his own office later. He would gain a basic knowledge of office management which would eliminate four or five years of foundering and learning from costly experience.

By this plan the employer would be benefited also, because the graduate would bring to the office the new and better methods of dentistry as taught in the schools of today.

A standing committee could be created in the American Dental Association and in the various state dental societies, to be known as the Council on Dental Internship. This council should be vested with the authority to establish standards for dental offices qualifying for such training. All fees should be agreed to by the component or state dental societies.—*G. S. Hildreth, D.D.S., 363 South Arlington St., Akron 6, Ohio.*

Oral Lesions Resulting from Inoculation Against Smallpox

To the Editor: A clinical observation which I believe has not been reported before is especially timely in view of the drive for universal revaccination against smallpox initiated by Commissioner Israel Weinstein of New York City.

I have examined several persons with a painful itching or burning in discrete circumscribed areas in various parts of the mouth (tongue, lips, gingivae) which clinically show slight edema or desquamation. These lesions appear, with varying intensity, three to four days after vaccination against smallpox. No doubt the majority of the patients report no symptoms of this type, but for those who are affected the diagnosis may have puzzled some dentists.

It is possible that other forms of immunization may produce temporary aberrations of the oral tissues which previously have not been thus associated.—*Samuel Charles Miller, D.D.S., Professor and Chairman of the Department of Periodontia, College of Dentistry, New York University.*

LIST OF DENTAL OFFICERS

SEPARATED FROM ARMY DENTAL CORPS

THE following list of dental officers separated from the Army Dental Corps does not include rank because such information is no longer furnished by the Surgeon General's Office. Publication will be given to other names as soon as possible.

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Burbank	Chapton, Francis F.
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Lemoore	Allen, Ellsworth M.
Los Angeles	Adams, Gordon K.
Oakland	Kavanaugh, Maurice
Piedmont	Sheets, George R.
Richmond	Stolker, William F.
San Francisco	Skendle, Roy C.
Selma	Brown, Robert H.

Colorado

Denver	Smith, Robert O., Jr.

Connecticut

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New Haven	Turkoff, Milton H.
Stamford	Hirschberg, Wallace B.

Florida

Tampa	Ammons, Charlie A.

Illinois

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Chenoa	Mann, Richard E.
Chicago	Applebaum, Jacob
Chicago	Asher, Carl A.
Chicago	Frey, Beoda J.
Chicago	Goodwin, Everett
Chicago	Hoyt, Nelson D.
Chicago	Kirz, George M.
Chicago	Klaper, David
Chicago	Krolik, Paul P.
Chicago	Pallotto, Romeo A.
Chicago	Propati, Joseph A.
Chicago	Ritter, George
Chicago	Rowan, William A.
Des Plaines	Shales, Robert G.
Downers Grove	Barr, Harry G.
Evanston	Bronson, Earle A., Jr.
Springfield	Duddleston, Louis C.

Indiana

Hammond	Meisel, Raymond R.
Marion	Goebel, Russell W.
Sullivan	DeFrank, Victor
Terre Haute	Van Horn, William A.

Iowa

Independence	Pardun, Russell R.
Independence	Schrader, Lowell G.
Shenandoah	Warin, George L.

Kansas

Ingalls	Penner, Daniel S.

Kentucky

Louisville	Simon, William J.
Louisville	Tagliarino, Vincent A.

Louisiana

New Orleans	Levett, Duane W.

Maine

Bangor	Brown, Edwin A.

Maryland

Baltimore	Katz, Stanley

Massachusetts

Canton	Cooper, Leo E.
Medford	Bichajian, John
Methuen	McEvoy, John R., Jr.
Springfield	Goldsmith, Lester P.
Worcester	Maykel, William G.
Worcester	Robinson, Leonard

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Detroit	Gitlin, Nathan B.
Detroit	Lazowski, Robert C.
Detroit	Taniguchi, Frank K.
Detroit	Waldon, Sanford A.
Gladwin	Bradley, Francis K.
Ishpeming	Jaaksi, George B.
Romeo	Cunningham, William J.

Minnesota

Eveleth	Carlson, Arnold C.
Excelsior	Elliott, Robert M.
Grand Rapids	Dawson, Robert H.
Minneapolis	Burns, Russell D.
St. Paul	Carlson, Vernon L.

Missouri

Bucklin	Bunton, Richard L.
Kansas City	Clond, Kenneth L. E.
Kansas City	Rogers, Jack J.
Macon	Humphrey, Howard B.
St. Louis	Mikola, Oliver J.
St. Louis	Rose, James M.

Montana

Butte	Moran, Joseph R.
South Glasgow	Bates, Eugene M.

DEATHS

Mabry, E. K., Oklahoma City, Okla.; School of Dentistry, Indiana University, 1903; died May 4; aged 69.

MacKinnon, Frederick A., Haverhill, Mass.; Dental School, Tufts College, 1909; died April 26; aged 83.

McQuone, Irvin W., St. Marys, Pa.; School of Dentistry, University of Pittsburgh, 1922; died May 15; aged 49.

Manning, Charles C., Minneapolis; died May 6; aged 75.

Meyer, Ludwig M., Salt Lake City; New York College of Dentistry, 1889; died May 2; aged 82.

Monson, E. E., Ogden City, Utah; died April 8; aged 60.

Moon, James F., Bloomfield, N.J.; Philadelphia Dental College, 1898; died May 14; aged 72.

Moore, Charles G., Whitesburg, Tenn.; died April 27; aged 84.

Newell, Vernon H. L., Detroit; Department of Dental Surgery, Detroit College of Medicine, 1900; died May 22; aged 72.

Nickell, Robert J., Philadelphia; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1879; died April 23; aged 91.

O'Malley, Walter F., Pittsfield, Mass.; died May 2; aged 71.

Patten, Charles C., Philadelphia; Pennsylvania College of Dental Surgery, 1906; died April 24; aged 70.

Paul, James E., Santa Ana, Calif.; Chicago College of Dental Surgery, 1901; died April 25; aged 76.

Rhodes, J. C., Puxico, Mo.; died May 8; aged 55.

Rich, Charles B., Miami Beach, Fla.; Omaha Dental College, Dental Department of the University of Omaha, 1899; died May 19; aged 69.

Rose, F. Max, Champaign, Ill.; College of Dental Surgery, University of Michigan, 1911; died March 30.

Rourke, George H., Chicopee Falls, Mass.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1904; died April 26.

Schmidt, Alfred L., Davenport, Iowa; Dental School, Northwestern University, 1899; died May 13; aged 69.

Scholl, Charles, Reading, Pa.; School of Dentistry, Temple University, 1888; died May 19; aged 78.

Shearer, George W., Summerfield, Kan.; died April 10; aged 66.

Shields, Romie B., Fayette, Mo.; died in May; aged 66.

Smith, Charles E., Delaware, Ohio; died March 27; aged 72.

Smith, William T., St. Louis; died May 8; aged 44.

Spencer, James F., Grand Rapids, Mich.; College of Dental Surgery, University of Michigan, 1913; died May 16; aged 55.

Stedman, Oliver E., Wakefield, R.I.; New York College of Dentistry, 1895; died April 28; aged 80.

Stein, John B., New York; died May 16; aged 77.

Stilson, Hubert H., Hot Springs, Ark.; School of Dentistry, Indiana University, 1911; died April 14; aged 61.

Swenson, Verne, West Allis, Wis.; died April 23; aged 49.

Thompson, Daniel M., Niagara Falls, N.Y.; College of Dental Surgery, University of Michigan, 1898; died May 11.

Thompson, Thomas C., St. Louis; died April 28; aged 48.

Tidgewell, Frederick T., New Haven, Conn.; died April 21.

Tracy, Llewellyn, Margate, N.J.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1905; died April 17; aged 65.

Underwood, F. Hicks, Buffalo; School of Dentistry, University of Buffalo, 1897; died May 8; aged 83.

Ungerer, Herbert L., Lyons, N.Y.; School of Dentistry, University of Buffalo, 1919; died May 7; aged 59.

Vedder, Jonathan B., Akron, Ohio; School of Dentistry, Temple University, 1898; died April 14; aged 72.

Wilcox, Thomas L., Philadelphia; School of Dentistry, University of Pennsylvania, 1909; died May 4; aged 63.

Willett, George A., Helena, Mont.; died April 26; aged 78.

Williams, Everette O., Racine, Wis.; College of Dentistry, Marquette University, 1925; died April 27; aged 44.

Willis, William A., New Orleans; Meharry Dental College, Dental Department of Meharry Medical College, 1910; died April 17; aged 59.

Wilton, Orvie N., Belding, Mich.; College of Dental Surgery, University of Michigan, 1913; died April 13; aged 57.

Wood, Guy L., Leaf River, Ill.; College of Dentistry, State University of Iowa, 1898; died April 14; aged 52.

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THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION
222 East Superior Street, Chicago 11, Illinois
Telephone WHItehall 6730 Cable Address: ADAECO

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ANNOUNCEMENTS

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	April 15–17, 1948	Birmingham	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona			B. K. Litt	68 E. Congress, Tucson
Arkansas			I. M. Sternberg	Merchants Bank Bldg., Ft. Smith
California			L. E. Linehan	450 Sutter St., San Francisco
S. California	Sept. 15–17	Los Angeles	M. E. Ralston	903 Crenshaw Blvd., Los Angeles 6
Colorado			R. A. Downs	724 Republic Bldg., Denver 2
Connecticut			E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			J. Krygier	309 S. State St., Dover
D. of Columbia			K. H. Wood	202-1835 Eye St., N.W., Washington
Florida	Nov. 10–12	St. Petersburg	J. I. Todd	433 St. James Bldg., Jacksonville
Georgia	Oct. 19–22	Atlanta	J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii	October	Honolulu	J. H. Dawe	P. O. Box 39, Honolulu 10
Idaho			H. F. Miller	Moscow
Illinois	Oct. 9–11	Peoria	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana			E. E. Ewbank	Kingman
Iowa			A. N. Humiston	417 Higley Bldg., Cedar Rapids
Kansas			F. A. Richmond	1008 Huron Bldg., Kansas City
Kentucky			J. L. Walker	640 Barbee Way, S., Louisville
Louisiana	April 8–10, 1948	Alexandria	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine			A. H. Garcelon	State House, Augusta
Maryland			J. H. Shackelford	706 Baltimore Life Bldg., Baltimore 1
Massachusetts	May 3–6, 1948	Boston	P. E. Adams	227 Commonwealth Ave. Boston 16
Michigan			F. Wertheimer	Michigan Department of Health, Lansing
Minnesota	Feb. 23–25, 1948	St. Paul	L. M. Cruttenden	Lowry Medical Arts Bldg., St. Paul
Mississippi			O. L. Colee	Magnolia
Missouri			C. W. Digges	Exchange National Bank Bldg., Columbia
Montana			C. S. Renouard	305 Phoenix Bldg., Butte
Nebraska			F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada			L. G. Jacob	505 Chestnut St., Reno
New Hampshire			F. E. Williams	814 Elm St., Manchester
New Jersey	April 20–23, 1948	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico			J. S. Eilar	First National Bank Bldg., Albuquerque
New York	May 10–13, 1948	Syracuse	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	April 26–28, 1948	Asheville	C. W. Sanders	Benson
North Dakota			K. G. Allen	Fargo
Ohio	Nov. 9–12	Cleveland	E. G. Jones	185 E. State St., Columbus
Oklahoma			E. W. Wise	Medical Arts Bldg., Tulsa
Oregon			W. H. Hurley	922 Selling Bldg., Portland 5
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Washington			F. J. Dingler	1502 Medical & Dental Bldg., Seattle 1
West Virginia			C. J. Gavelda	Clarksburg
Wisconsin	March 30–April 1, 1948	Milwaukee	K. F. Crane	1233 Bankers Bldg., Milwaukee 2
Wyoming			J. D. McNiff	208 Grand Ave., Laramie

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Kentucky	Sept. 22–25	Louisville	R. I. Todd	Western Union Bldg., Richmond

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
American Academy of Applied Nutrition, Twelfth Annual Meeting	Oct. 4–5	Del Mar, Calif.	A. G. James Secy.	409 N. Camden Drive, Beverly Hills, Calif.
American Academy of Oral Pathology	Aug. 3	Boston	J. L. Bernier Secy.	Lt. Col., Army Medical Museum, Washington, D. C.
American Academy of Periodontology, Twenty-Ninth Annual Meeting	July 31–Aug. 2	Boston	C. E. Chamberlain Secy.	633 Jefferson St., Peoria, Ill.
American Academy of Plastic Research in Dentistry	Aug. 3	Boston	S. W. Cotter Secy.	11059 S. Hale Ave., Chicago
American Anti-Arthritis Association	Oct. 4–5	Del Mar, Calif.	R. T. Pottenger Secy.	Monrovia, Calif.
American Association of Dental Editors	Aug. 2	Boston	O. W. Brandhorst Secy.	4952 Maryland Ave., St. Louis
American Association of Endodontists	Aug. 2–3	Boston	T. J. Hill Secy.	2085 Adelbert Rd., Cleveland
American Association o Dental Examiners	Aug. 2–3	Boston	R. P. Thomas Secy.	Francis Bldg., Louisville, Ky.
American Association of Public Health Dentists	Aug. 2–4	Boston	E. Taylor Secy.	State Board of Health, Austin, Texas
American Association of Women Dentists	Aug. 3	Boston	M. K. G. Robinson Secy.	4906 Walnut St., Philadelphia
American Board of Oral Surgery	July 29–30*	Boston	L. M. FitzGerald Secy.	718 Roshek Bldg., Dubuque, Iowa
American College of Dentists	Aug. 2	Boston	O. W. Brandhorst Secy.	4952 Maryland Ave., St. Louis
American Dental Assistants Association	Aug. 4–7	Boston	A. M. Ferguson Secy.	709 Centre St., Jamaica Plain, Mass.
American Dental Association	Aug. 4–8	Boston	H. Hillenbrand Secy.	222 E. Superior St., Chicago
American Dental Hygienists' Association	Aug. 4–8	Boston	A. R. Fisk Secy.	1704 N. Troy St., Arlington, Va.
American Dental Society of Europe	July 27–30, 1948	London	K. C. Campbell Secy.	88 Portland Place, London, W. 1.
American Public Health Association, Seventy-Fifth Annual Meeting	Oct. 6	Atlantic City, N. J.	R. M. Atwater Secy.	1790 Broadway, New York 19
American Society for the Advancementof General Anesthesia in Dentistry	Oct. 27	New York	M. H. Feldman Secy.	730 Fifth Ave., New York
American Society of Dentistry for Children	Aug. 2–4	Boston	R. W. Erwin, Jr. Secy.	613 Corbett Bldg., Portland, Ore.
American Society of Oral Surgeons, Twenty-Ninth Annual Meeting	July 31–Aug. 2	Boston	H. Bear Secy.	1112 E. Clay St., Richmond 19, Va.
National Dental Association, Thirty-Fourth Annual Meeting	Aug. 11–15	Detroit	J. A. Jackson Secy.	Box 197, Charlottesville, Va.
Federacion Odontologica Latino Americana, Fifth Congress	Oct. 3	Buenos Aires	D. M. Cohen Secy.	Calle Junin No. 959, Buenos Aires, Argentina
Annual Seminar for the Study and Practice of Dental Medicine	Oct. 19–24	Yosemite Valley, Calif.	M. G. Lewis Secy.	1618 Ninth Ave., San Francisco 22
Montreal Dental Club, Twenty-Third Annual Fall Clinic	Oct. 22–24	Montreal	M. L. Donigan Director	Drummond Medical Bldg., 1414 Drummond St., Montreal 2, Canada
Academy of Denture Prosthetics	July 28–Aug. 3	Boston	I. L. Furnas Secy.	928 Silverado St., La Jolla, Calif.
International Dental Congress, Tenth Annual Meeting	Aug. 4–8	Boston	C. F. L. Nord Secy.	The Hague, Holland
New England Dental Society	Nov. 5–6	Boston	J. F. Barton Secy.	43 Farmington Ave., Hartford 5, Conn.

*Examinations for certification.

Name	Date	City	Secy. or Chm.	Address
Tufts College Dental School, Class of 1922 Reunion	Aug. 5	Boston	N. Becker	100 Boylston St., Boston 16
University of Buffalo, School of Dentistry Alumni Association, Forty-Fifth Annual Meeting	Oct. 14–16	Buffalo	E. L. Ruffing Chm. Publicity	233 W. Ferry St., Buffalo 13
University of Oregon Annual Dental School Alumni Meeting	Sept. 25–27	Portland	R. B. Keller Secy.	Medical-Dental Bldg., Portland, Ore.
Odontological Society of Western Pennsylvania, Sixty-Sixth Annual Meeting	Oct. 28–30	Pittsburgh	W. E. Craig Secy.	Jenkins Bldg., Pittsburgh 22
Wisconsin Dental Economic Study Club	Aug. 29–30	Madison	M. M. Tuttle Secy.	20 N. Carroll St., Madison 3, Wis.

INTERNSHIPS, EXTERNSHIPS, RESIDENCIES AND FELLOWSHIPS

Boston City Hospital, Boston. Oral Surgeon-in-Chief, Stephen P. Mallett.

The Children's and Infants' Hospital (a Unit) of Boston. Address Paul K. Losch, 300 Longwood Ave., Boston.

The Children's Memorial Hospital, Chicago. Administrator, Mabel W. Binner, 707 Fullerton Ave., Chicago.

Columbia University, School of Dental and Oral Surgery. Associate Dean, Bion R. East, 630 W. 168th St., New York 32.

Delaware Hospital, Inc., Wilmington. Medical Director, Delaware Hospital, 501 W. Fourteenth St., Wilmington 13.

Eastman Dental Dispensary, Rochester, N. Y.

Fellowships for Research and Graduate Work in the Dental Sciences, University of Rochester. Dean, George H. Whipple.

The Forsyth Dental Infirmary for Children. Director, Percy R. Howe, 140 The Fenway, Boston.

International Grenfell Association. Staff Selection Committee, 156 Fifth Ave., New York.

Jewish Sanitarium and Hospital for Chronic Diseases. Director, Leonard Kohn, Dental Division, E. Forty-Ninth St. and Rutland Road, Brooklyn 3, N. Y.

Joseph Samuels Dental Clinic of the Rhode Island Hospital, Providence. Director, Ernest A. Charbonnel.

New York Foundling, New York. Medical Director, Alfred J. Vignec, 175 E. Sixty-Eighth St., New York.

Notre Dame Bay Memorial Hospital, Twillingate, Newfoundland. Address John M. Konopka, 25 W. Independence St., Shamokin, Pa.

Richmond Freeman Memorial Clinic for Infants and Children, Dallas, Texas. Executive Director, Dora B. Foster, 3617 Maple Ave., Dallas.

University of Illinois, Graduate School. Fellowships for Research and Graduate Work. Secretary, Committee on Graduate Work in Medicine, Dentistry and Pharmacy, 1853 W. Polk St., Chicago 12.

University of Illinois, Research and Educational Hospital, Chicago. Supervisor of Hospital Dental Services, Maury Massler University of Illinois, 808 S. Wood St., Chicago 12.

University of Oregon, Medical School and Hospitals, Portland. Administrator, Charles N. Holman, 3181 S. W. Marquam Hill Road, Portland.

Walter G. Zoller Memorial Dental Clinic, University of Chicago. Director, J. R. Blayney, 950 E. Fifty-Ninth St., Chicago 37.